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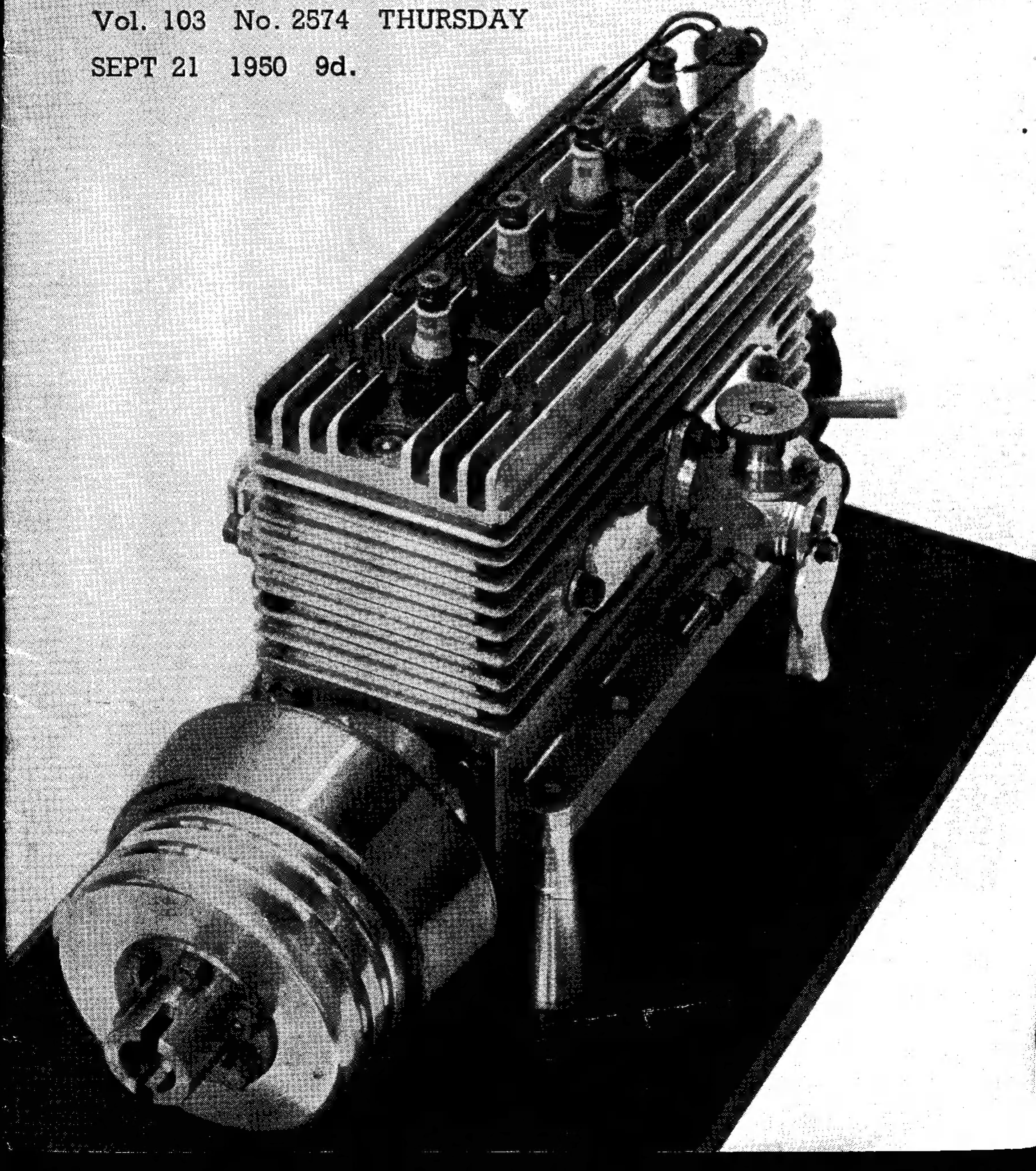


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

21ST SEPTEMBER 1950 VOL. 103 NO. 2574

SMOKE RINGS

Our Cover Picture

● THE ENGINE shown this week is the 10 c.c. four-cylinder two-stroke by Mr. Frank Boler, of Leatherhead, which won a bronze medal and the F. W. Atkinson prize at the "M.E." Exhibition. This engine was described briefly in our issue of September 7th, in the report on Internal Combustion Engines at the Exhibition. Many constructors of model power boats and racing cars at the present time are devoting serious attention to the miniature multi-cylinder engine, but this is one of the first completed engines intended specially for use in a model racing car that we have so far encountered. A particularly interesting feature of this engine, which has already been commented on in the above description, is the fact that the data for its design has been obtained from various engine designs which have been published in THE MODEL ENGINEER in the past. This does not, in any way, detract from the credit due to the designer of the engine, since all design must necessarily utilise data which has been built up by previous designers, to some extent at least. Many of the designers of successful models, not only in this particular field, but also in locomotives, stationary engines, power boats, etc., have found in the past volumes of THE MODEL ENGINEER an up-to-date and comprehensive reference library on all the essential points of design. We have received several enquiries from readers regarding the details of this very interesting multi-cylinder two-stroke engine, which is at present still in the development stage. We hope, however, to be able to satisfy their requests as soon as tests are completed, as Mr. Boler has kindly promised to give us facilities for producing a fully detailed article on its construction.

Practise the Art

● WE OFTEN wonder why it is that many modellers, when they build locomotives, ships and other models which carry names or numbers which, in the prototypes, are painted or transferred, go to a great deal of trouble to fret all the letters and numerals out of metal, sweat them into place and then, more often than not, paint them over.

This process must surely involve a lot of work and time which, in the end, is wasted because the result is usually unrealistic, if it is not entirely spoiled by some of the letters or numerals moving slightly during the sweating process.

The usual answer to a direct question on the subject is a remark to the effect that the modeller is "no hand with a brush"! Then, why does he not practise with the brush? Half an hour spent in this way should be enough to acquire reasonable efficiency and confidence in the management of the brush and colours; a man does not necessarily have to be a trained sign-writer in order to produce a satisfactory result, and the method is easier and more correct than any other.

Coal Trials

● WE HAVE been very interested to learn that an experimental coal trial was held recently on the West Riding Small Locomotive Society's track at Blackgates, Bradford. At the moment of writing, we have no particulars as to the results obtained ; that they were interesting, however, is suggested by the fact that another coal trial was arranged at the same place last Sunday.

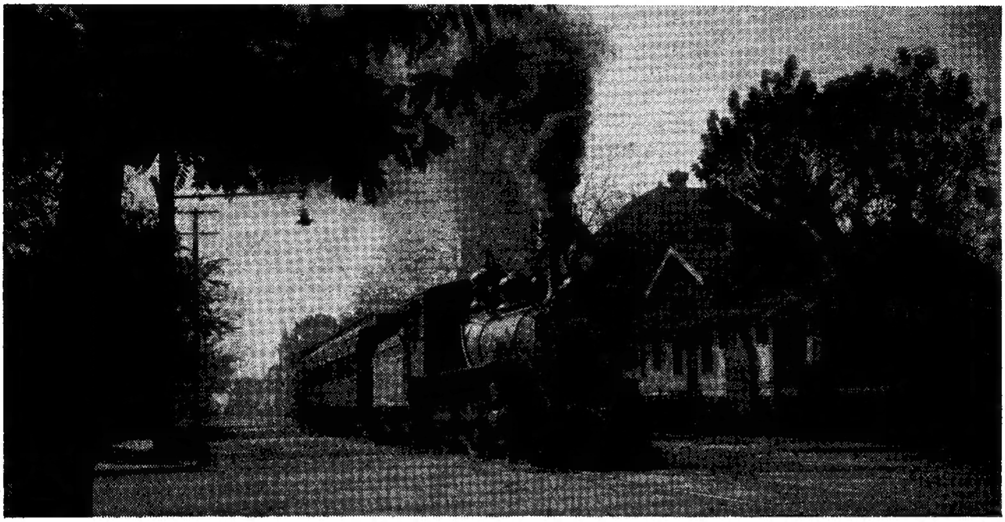
The aim of most good locomotive men is, or should be, to obtain the maximum power output on the minimum consumption of fuel. At least, this idea, until recent times, has been generally accepted as the logical one ; but we know of one well-known designer of full-size locomotives who has proclaimed publicly that the basis of locomotive performance is the amount of work done on the maximum consumption of coal, and his own engines seem to exemplify this idea in no uncertain manner. Much would seem to depend upon the interpretation of the dictum, however.

For the moment, we prefer the older and more definite notion that what really matters in locomotive performance, and appears to provide a sound basis on which to assess locomotive efficiency, is the maximum drawbar horsepower registered per pound of coal burnt per hour. It is possibly some information of this nature that the W.R.S.L. Society is endeavouring to collect ; as yet, there is very little of it available, and we shall be interested to note, in due course, whether some kind of basic information to which the performance of any miniature steam locomotive can be related can be made available. Test stands for bench tests, and continuous tracks for running tests are now readily accessible ; therefore, we should be able, before long, to say with some certainty what any small locomotive *should* be able to do, and compare that with what it is *observed* to do. If the two sets of information disagree, there should not be much difficulty in discovering why, now that there are facilities for observing actual performance in two distinct, but comparable, ways.

Efficiency which can be based on data actually observed and recorded is more acceptable and conclusive than that based on calculation alone.

An American Train in the Street

● ONE OF our American readers, Mr. J. Foster Adams, of Portland, Oregon, has kindly sent us a letter enclosing some photographs, one of which is reproduced herewith. Mr. Adams writes :—



"Noticing from recent comments in THE MODEL ENGINEER that interest seems to have been aroused about full-size locomotives running in city streets, I remembered two pictures that I shot on October 9th, 1921, and enclose them just in case you might want to use them . . . The train, a Northern Pacific passenger, is running through the heart of down-town Pendleton, the famed 'Round Up' city. The railroad was one of two branch lines which provided passenger connections, out of Pendleton, with the lines to the north. Now, no passenger trains are run on either branch line, only a freight now and then. Travellers who do not have their own transportation go by bus.

"The Northern Pacific had a good station building in Pendleton. The last time I was in the city, about ten years ago, passenger trains had not been running for some time. Out of curiosity, I walked to the old station, and the windows were boarded up. Recently, I heard the building had been torn down.

"The locomotive 672 was a Baldwin of 1889, 63 in. drivers with axles spaced 9 ft. apart. I was told in 1922, by the yard master in Minneapolis, Minnesota, that he thought these engines were acquired by the N.P. when they bought the St. Paul and Duluth line. These were about the nicest 'standard' engines to be found and were about the largest practicable size for the type with the firebox between the driving axles."

We have selected what we consider to be the prettier of Mr. Adams's shots, and we think readers will agree that it is far more picturesque than the English scene depicted on the cover of THE MODEL ENGINEER for May 25th last.

Three Fine Power Boats — and a Fine Week-End !

by W. J. Hughes

TO me, one of the greatest pleasures of being a model engineer, is the fact that the hobby has brought me so many friends—not only among my colleagues of the Sheffield S.M.E.E., but by correspondence from many parts of the British Isles, and indeed, of the globe. Many of these friends I have never seen in the flesh, (and, I fear, never will unless my financial outlook changes greatly for the better !) ; so it is as pen-friends they must remain, especially those abroad.

Until fairly recently, it was only in that category that I knew Mr. John Norris of Bristol, and it was therefore with great pleasure, that I was able at last to accept his oft-repeated invitation to spend a short holiday with him and his family at their summer quarters outside Weston-super-Mare. I had already learned a lot about his modelling activities from his letters ; and from the photographs enclosed with the latter, it was obvious that they were of a high standard, in spite of Mr. Norris's assertions that the photographs flattered the models. I had also read of the overhaul, or rather I ought to say rebuilding, of a 29-year-old, 3-litre Bentley, and was looking forward to a promised run in her, having been an admirer of that great marque ever since the days of Birkin and Barnato in the 24-hour Le Mans races.

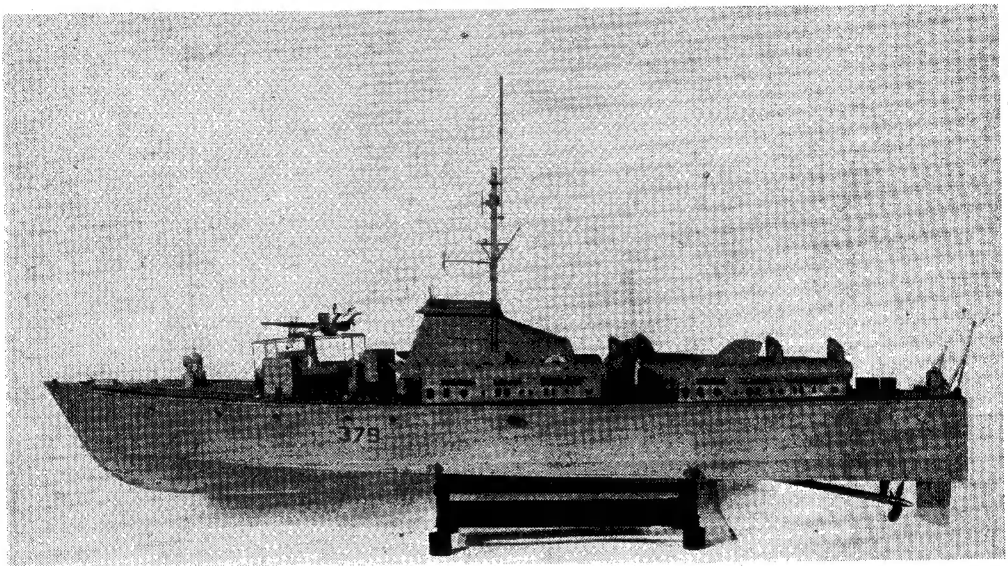


Photo by] [*Bromhead, Bristol*

Photo No. 1. *The ½-in. scale Vosper motor torpedo boat designed by the author and built by Mr. John Norris. Powered by a 6-c.c. petrol engine, the boat has a speed of* 10 *knots*

An Ardent Ship-Lover

My feeling of anticipation was intense, therefore, as my train steamed into Temple Meads station. It was my first visit to Bristol, and as we drove to Mr. Norris's office in the dock area, it was pleasant to see the funnels and masts in the heart of the town itself. Indeed, we called on the way to inspect and duly admire three converted "Fairmile B" M.L's. in a nearby basin.

Then on to the office, where my eye was caught immediately by three ship models on the mantelpiece.

One of these was a small glass-case model of the full-rigged ship *The Great Republic*, which I was implored not to inspect too closely, because it was the builder's first effort at modelling, as a schoolboy. Obeying this injunction (with a mental note that my own "first effort" would look sorry at the side of this one !), I turned my attention to the others, which were a pair of very nicely executed ships-in-bottles.

The first, curiously enough, was of a vessel about which I had just been reading in the train in John Anderson's book, *Coastwise Sail*, (Percival Marshall & Co. Ltd.) the *Lady of Avenal*, a brigantine of 163 tons built in 1874. (According to the book, she is still in existence,

though unlikely to sail again.) Comparing the model with the photographs in the book, it was obvious that the builder had taken pains to obtain a likeness, though the deckhouse was well oversize. Several of her sails were set, and the rigging was much more detailed than many ships-in-bottles I have seen.

The other "bottled" miniature was of that famous flyer of the last century, the *Ariel* of 879 tons register, built in 1865. Here again the builder had taken great pains—for example, the lines of the clipper hull had been well achieved, most of the sails were set, and the rigging was well done. But once more the deckhouses were much over-scale.

When I commented on the "atmosphere" of this pair of models, which would be an asset to any mantelpiece, Mr. Norris told me with a smile that in fact he was not responsible for building them, having picked them up for the proverbial song in a local junk shop years ago. But, whoever the unknown maker was, he was assuredly a man with an eye to the beauty of a ship, and the necessary skill competently to preserve that beauty in model form. I wonder if any Bristol reader could shed any light on his identity?

Leaving the mantelpiece, and looking out of the office window, one was aware that Mr. Norris had every excuse to be an ardent ship-lover. The office is situated on the side of a dock, there are two ship-building firms as immediate neighbours, and masts and funnels abound in most directions, since the office is on an island between two channels. Not far away the extensive fleet of paddlers of Messrs. P. and A. Campbell was laid up for the winter, but more of these anon.

Three Fine Power Boats

The drive home gave me my first view and crossing of the 260 ft. high Clifton Suspension Bridge, that fine structure over the breath-taking Avon Gorge. The bridge was designed by I. K. Brunel in 1831, and incidentally it incorporates the suspension cables, and some other bits and pieces of what had been the original Hungerford Bridge over the Thames. Being shown to my room, I discovered that I was to occupy what might be termed "the owner's

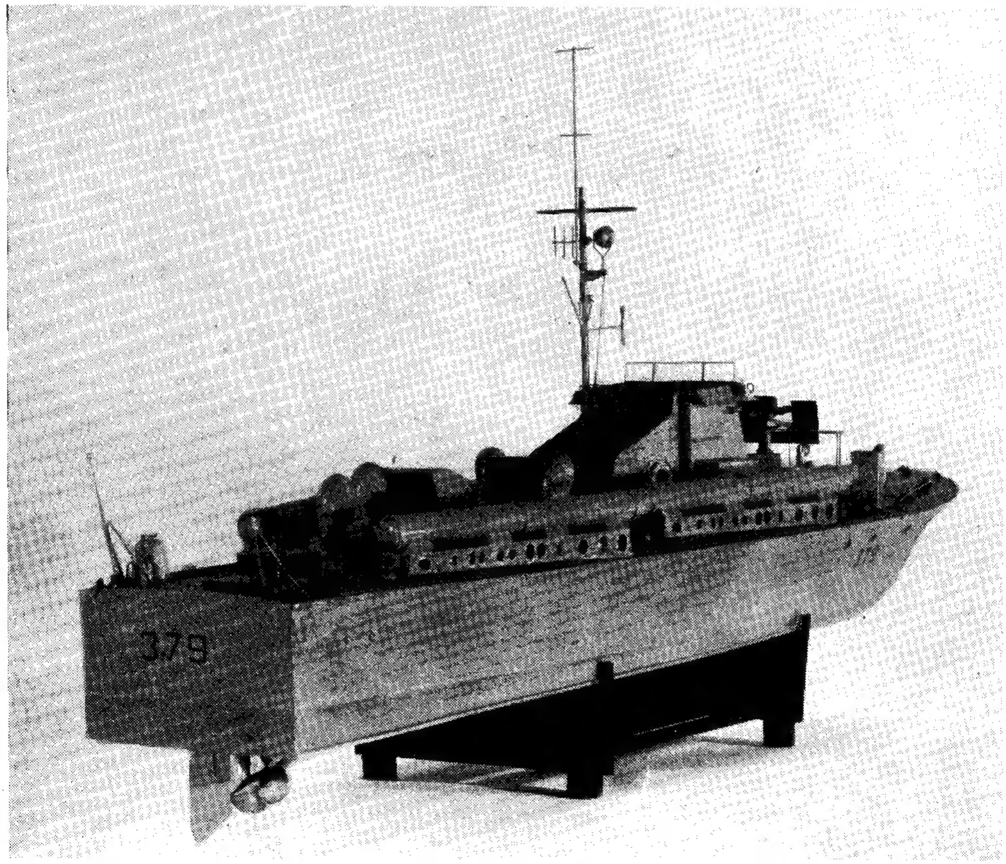


Photo by] [*Bromhead, Bristol*
Photo No. 2. Another view of the model M.T.B., which shows the finely-flared bows to advantage

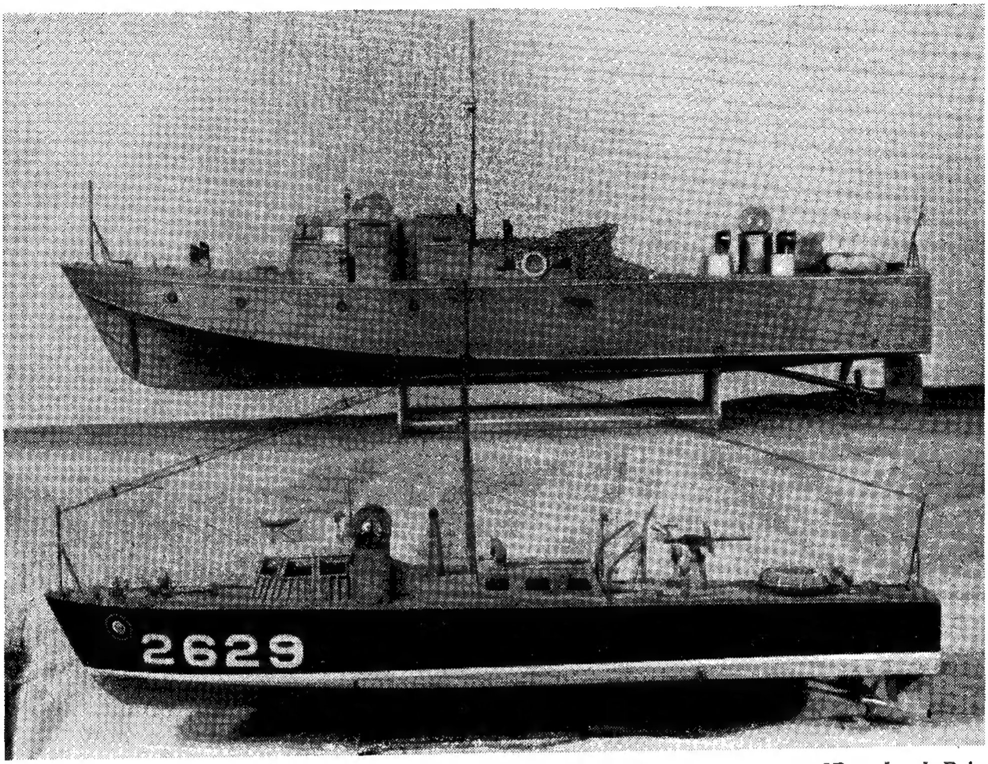


Photo by] [*Bromhead, Bristol*
Photo No. 3. (*Above*). *The Vosper air/sea rescue launch before painting. Note exhaust-pipe of the* $3\frac{1}{2}$-*c.c. petrol engine protruding through hull side.* (*Below*). *The* $\frac{1}{2}$-*in. scale Thornycroft A.S.R.L. When the photo was taken she had three clockwork motors, but is now fitted with a 2-c.c. diesel engine*

cabin," since Mr. Norris had turned out himself for my greater well-being—typical of the West Country hospitality evident throughout my short visit.

And there, poised on mantelpiece, cabinet and cupboard, were the three boats I had already admired from a long distance—a Thornycroft A.S.R.L., a Vosper A.S.R.L., and a Vosper M.T.B., all to $\frac{1}{2}$-in. scale. It is pleasant to be able to state that they were quite up to the standard I had anticipated, and that Mr. Norris, in creating these excellent models, has achieved that natural atmosphere of reality which is so elusive, and is sometimes missing from other perhaps more super-detailed models. I think that this quality shows in the photographs which accompany these descriptive lines.

It is not proposed to describe these boats at full length in this article, because another article especially about them has been prepared for our companion *Model Ships and Power Boats*; but a brief description may not be out of place herewith.

To deal with the last-built first, the Vosper M.T.B., this was one of the very first models to be built to my own drawings, which are now obtainable from Percival Marshall & Co. Ltd. (The set includes, General Arrangement—Elevation, Deck Plan, Bridge details, etc.—a sheet giving constructional details, and a booklet containing printed instructions.)

She is built to $\frac{1}{2}$-in. scale, giving a hull $36\frac{1}{2}$ in. long with a maximum beam of $9\frac{1}{2}$ in., which makes her very stable. The bows are beautifully flared, which coupled with her steadiness makes her a good sea-boat unlikely to take water over her decks.

The hull is timber-built: a plywood keel or backbone supports three-ply formers or bulkheads, which are connected each to each at chine and gunwale by means of shaped stringers, which form a continuous curve from bow to stern. The skin, of thin three-ply, is cemented and screwed to the stringers, and to stiffening-pieces fixed to the edges of the bulkheads, and is then reinforced outside with muslin or thin linen.

The deck is also of thin (0.8 mm.) ply, part being removable (with some of the superstructure) to give access to the 6-c.c. petrol engine, which is magneto equipped, by the way. The bridge is of ply also, with Perspex windscreen; in all above-deck fittings lightness is the keynote, for the sake of stability.

Performance

The engine starts readily, due perhaps in part to the strong spark from the magneto, and the boat runs very well at a maximum speed of ten

knots on a straight course. At this speed the bows rise well out, but the vessel is rock-steady with an impressive bow-wave and wake.

The Air/Sea Rescue Launches

Similar methods of construction were used for the two A.S.R.L. hulls, of which the Thornycroft is 34 in. long, with a beam of 7½ in. This boat was driven originally by three clockwork motors coupled to a gearbox, from which two shafts drove the twin propellers. A speed of three of four knots was thus obtained, but now a 2-c.c. diesel engine has superseded the clockwork motors, giving about 7 knots, which looks much better.

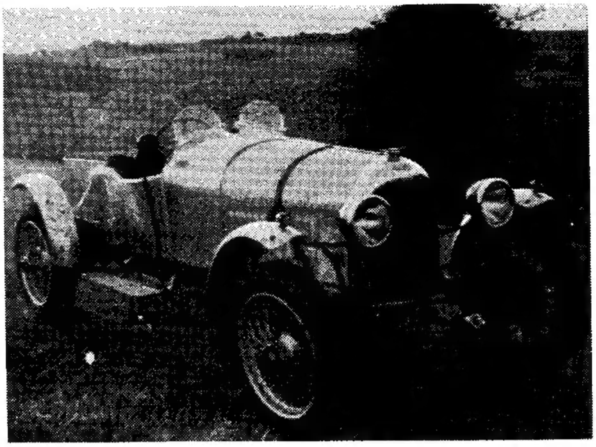


Photo by] [John Norris

Photo No. 4. The 29-year-old 3-litre Bentley, as rebuilt by Mr. Norris, and before being painted

The Vosper A.S.R.L. was unfinished, of course, when the photograph was taken. She has a 3.5 c.c. petrol engine of unknown vintage which was purchased secondhand. It revs. very fast, and propels the boat at up to 12 knots, at which speed she looks very well indeed, with bows well up and a boiling wake.

Unfortunately we were not able to run the boats flat out, because the river was very low indeed. However, there is a small pond at the bottom of the garden, and here we spent a very pleasant afternoon "messing about with boats." Even with rudders hard over, and turning in tight circles, the boats performed very well—but I did wish that the river-level had been higher!

Other Models

There were many other models in the "owner's cabin," but I will describe only two of them. One which intrigued me was a tiny British Power Boats A.S.R.L. which had been built from a "kit." The hull (10½ in. long) was built bread-and-butter style from balsa, and the lovely lines of this particular marque had been well achieved, with the pronounced flare, the reversed curve of the sheer line, and the whale-backed superstructure.

With a small clockwork motor geared to two propellers, the speed was in the region of four knots for about twenty yards. As an experiment, one propeller was removed, and the speed promptly jumped to about six knots, with the bows well out—an amazing sight! The propellers, by the way, were ½ in. diameter, simply twisted from sheet brass and sweated to the shafts.

On the mantelshelf a small solid scale model of a 4½-litre Bentley took the eye. It was in racing trim, with wire mesh stone guards to lamps, radiator, and petrol tank, and a fabric four-seater body with leather cover to rear seats and hood. The rubber tyres were from an old toy clockwork car, and being originally too large for the model, a section had been cut away and invisibly re-jointed with Bostik.

A finely-detailed chassis had supercharger, shock absorbers, leaf-springs, and full (non-working) steering-gear. Wheels were jig-built, using fuse-wire for the spokes; and the sports-type wings had been formed from the clips of snap-closure lids. A cross-bar was fitted to the radiator filler-cap, and a "winged B" Bentley badge was on the radiator nose.

The whole model was less than 6 in. long, but it was a fine example of the art of miniature scale-modelling.

Modelling Career and Workshop Equipment

Mr. Norris first started modelling when at school, with 1/72nd scale solid aircraft, mostly from kits, and 1/24th scale cardboard non-flying aircraft. Then came a long series of flying scale, semi-scale, and duration models, with a selection of gliders. What really stopped "aircraft production" was when a 50 in. flying scale Lysander crashed on its third flight and here I can sympathise, having stopped building aircraft for similar reasons!

A number of 50 ft. to 1 in. waterline ship-models were also built, but a turning-point was the acquisition of a secondhand 3½-in. centres Myford lathe (old-type), not too accurate when bought, but quite good now that sundry alterations and adjustments have been made. Having no engineering knowledge, Mr. Norris embarked on a course of self-instruction (like so many model engineers)—as he says: "Truly a case of the blind leading the blind!"

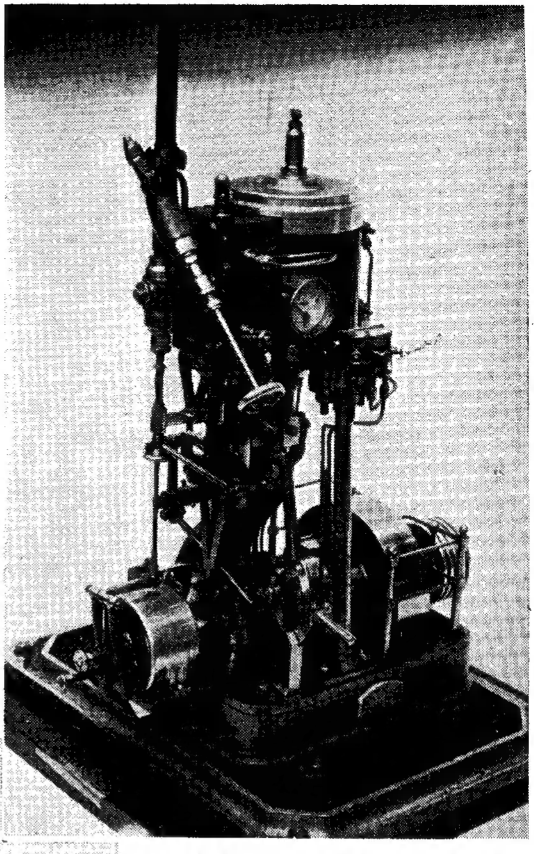
With the lathe came all the complications of drills, taps, dies, reamers and other hand-tools, and learning to use these, too. Other tools include a power grinder and a ¼ in. electric hand drill, which can be mounted on a stand, and some bench shears, which are extremely useful in cutting thin ply to shape. They were also very valuable in building the new aluminium four-seater body for the 3-litre Bentley. She was new in 1921, but following extensive repairs and renovations by Mr. Norris, she is mechanically as good as new, as she demonstrated in no uncertain way when I had my promised run in

(*Continued on page* 435)

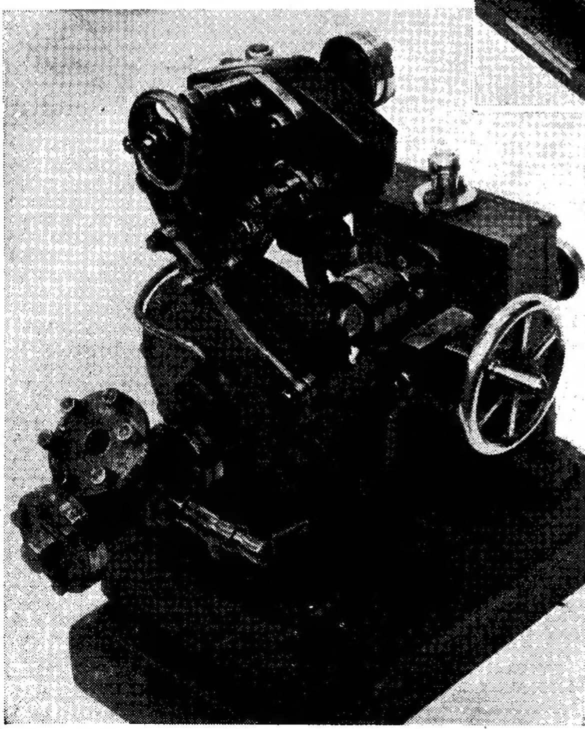
Mechanical Models at the "M.E." Exhibition

IN the issue of THE MODEL ENGINEER dated August 17th, we included a resume of Exhibition models picked at random. Now that the general rush following the event has subsided, we are able to give a further account of some of the exhibits which we trust will be of interest to our readers.

It is both interesting and heartening to note the continued popularity of steam, and our picture depicts an excellent example of a single-cylinder high-speed vertical engine, with reversing gear and oil-pump feed to the cylinder, by Mr. S. H. Clarke, of Stockton-on-Tees. The quality of craftsmanship here, visible in the illustration, is borne out by the fact that the model was awarded the Ferguson Prize, donated by Mr. V. B. Ferguson for the best stationary model steam engine of any type. It also received the award of a bronze medal.



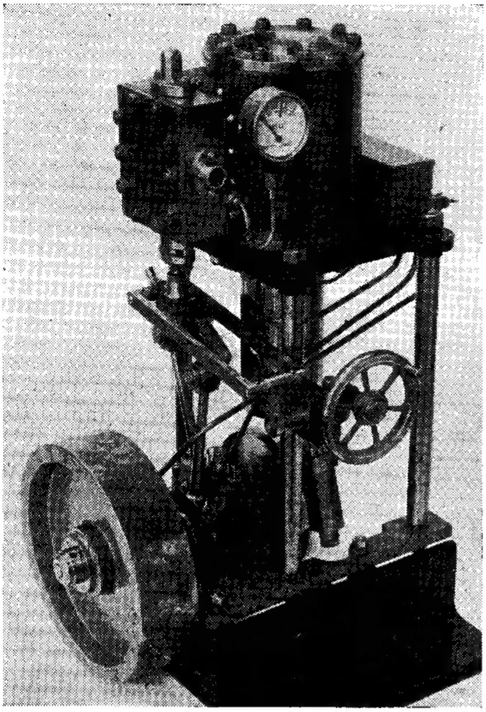
Mr. S. H. Clarke's single cylinder high-speed vertical steam engine



A steam turbine and gearbox by Mr. T. W. Geary

Another successful competitor from Stockton-on-Tees was Mr. J. W. Ayres, whose twin-cylinder reversing horizontal mill engine appeared on page 268 of THE MODEL ENGINEER dated August 24th. The model is of free-lance design, based on a similar type of engine at the Tees conservancy, and attracted much attention and favourable comment by virtue of its comparative simplicity. It was awarded a bronze medal.

A delightful example, which will appeal to the vintage enthusiast, is the Easton Amos "Grasshopper" beam engine, originally designed for high-speed running. The governor is operated through bevels, the crown wheel being fitted to the crankshaft, and the model, with a bore of $1\frac{1}{2}$-in.



operates at 180 r.p.m. It was made by Mr. H. J. Hawker, who also received a bronze medal. A photograph of this model also appeared in THE MODEL ENGINEER dated August 24th, page 267.

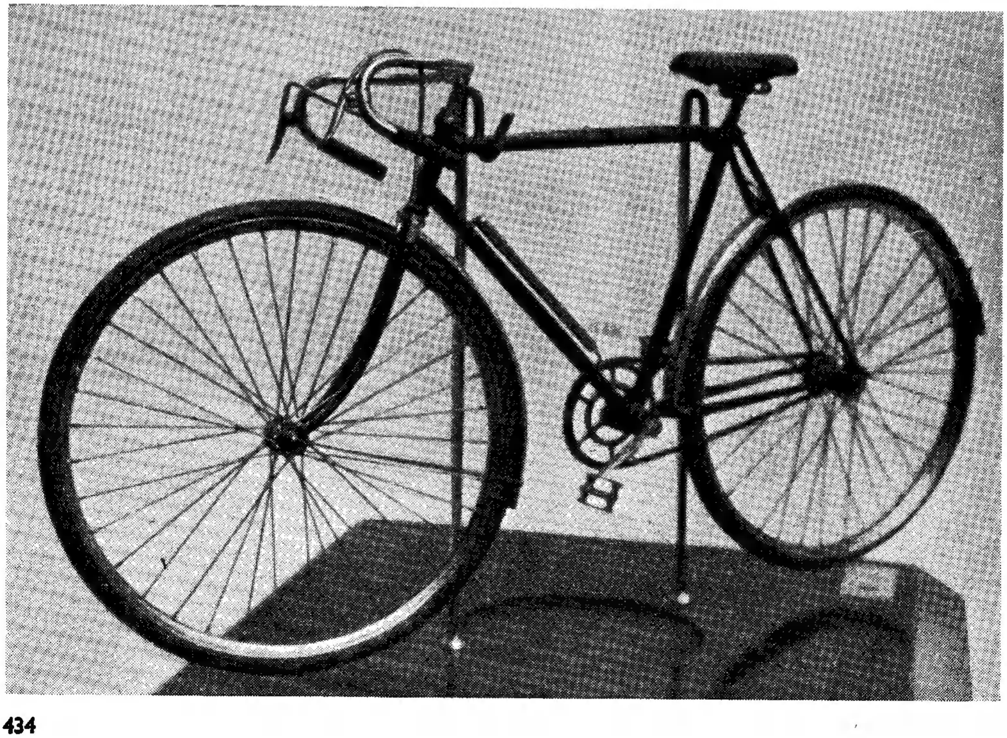
An interesting exhibit, of a type we shall look forward to seeing increase in popularity among our reader-builders, was Mr. T. W. Geary's steam turbine and gearbox which gave a 4 : 1 reduction. The spindle runs in ball-races, and lubrication is by a header tank and two drip-feed regulators. A wheel operates one of the two nozzles, the other being operable by a hand regulator, visible in the photograph.

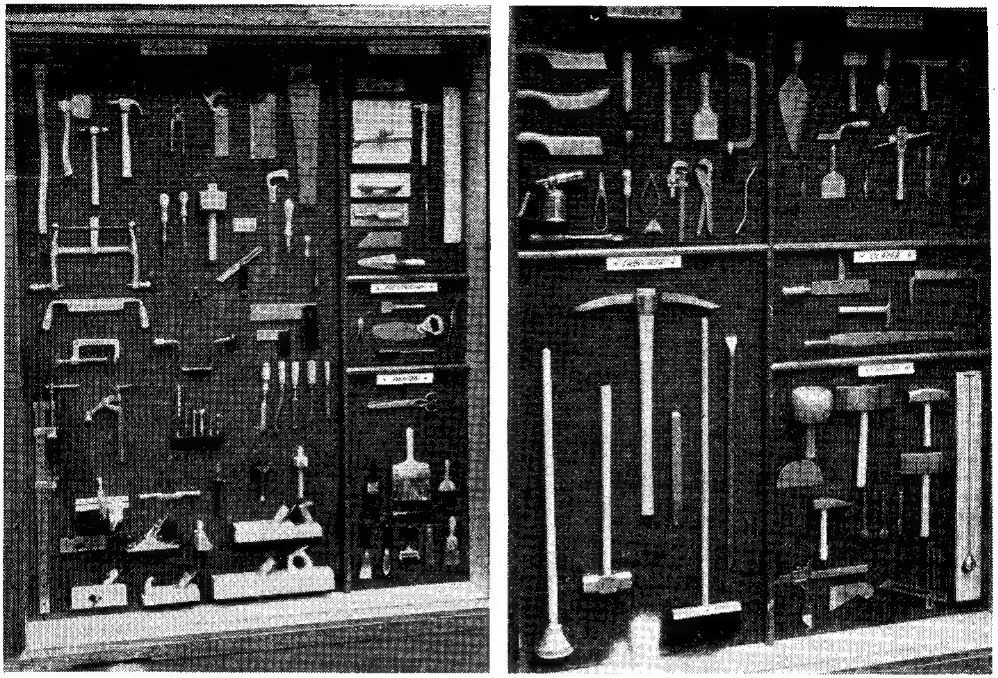
Our last " steam " photograph is of Mr. J. G. Lauder's very handsome single-cylinder vertical engine, with a bore and stroke of $1\frac{3}{4}$ in., which received a V.H.C. diploma. The neat layout of the lubrication system is particularly noteworthy, and the general design quite pleasing, both from the practical and aesthetic points of view!

A Lilliputian bicycle is not the sort of item one finds at every " M.E." Exhibition. That the one pictured here should be of such high quality speaks well for the efforts of its constructor, Mr. G. C. Seymour. The model is of a Rudge " Pathfinder," the frame being made from tubes

Left—Mr. J. G. Lauder's single-cylinder vertical engine

Below—The excellent example of a Rudge " Pathfinder " bicycle by Mr. G. C. Seymour





Mr. J. W. Thomas's miniature set of tools of the building trades. Truly a remarkable collection

of correct gauge-thickness, to a scale of 2½ in. to 1 ft. Functional caliper brakes are fitted, also a free-wheel rear hub, adjustable in the customary manner for chain-tensioning, rat-trap pedals, spring saddle, alloy mudguards and pump. In fact, the only items which appear to be missing are the valves which normally protrude from the wheel rims! The model was awarded a bronze medal.

A truly exquisite exhibit to which we fail to do justice by photographic depiction is the collection of tools of the building trades by Mr. J. W. Thomas. They represent most of the tools used in the building of a house, covering those of the carpenter, plasterer, electrician, painter, plumber, bricklayer, labourer, slater and mason. The collection received the award of a silver medal. They were to ⅛-in. scale.

Three Fine Power Boats

(*Continued from page* 432)

her. She has since won her race in some trials at over 90 m.p.h., which makes it seem that the "blind led the blind" with some success!

At the time of writing, a $\frac{3}{16}$-in. scale model of the *Empress Queen* is well on the way to her launching. The prototype is a turbine steamer, the latest of the extensive P. and A. Campbell excursion fleet of Bristol, and a vessel of fine lines. This model is to be engined with a vertical twin-cylinder steam marine-type engine, which Mr. Norris has built already.

Talking of the Campbell fleet brings me to my last morning in Bristol, when we had the great pleasure of visiting the engine-rooms of two or three of them. As mentioned earlier, the boats were laid up for the winter, and in one or two cases the engines were partly dismantled in preparation for the B.O.T. inspection—a very fortuitous occurrence for me! Another feature which gave added interest was in discovering fellow model engineers in the chief engineers of two of the vessels. As might be expected in the circumstances, however, we talked to such an extent that I missed my train!

But why worry? There was another a couple of hours later, and I'd have hated to have missed those conversations. As it was, it was with great reluctance that eventually I shook hands with my host again at Temple Meads station. I'd certainly had a grand week-end; one which will live long in my memory, and which I look forward to repeating at some future date.

An Effective Vice Attachment for Holding Thin Flat Plates

by W. M. Halliday

CONSIDERABLE trouble will frequently be experienced by the engineer when having to file, scrape, or mark-off outlines for machining, etc., on the surfaces of very slender components made in thin sheet metal, such [redacted] aluminium, annealed brass, copper [redacted] zinc. The soft metals of this character will usually present the greatest difficulties.

Difficulties when Gripping Parts in Vice

Generally to conduct operations of the above kind it will be necessary or most convenient to hold the component between the parallel jaws of the ordinary bench vice, and it is precisely in this connection that the chief difficulties will arise.

If such [redacted] component is gripped too tightly across opposed sides when inserted into the vice jaws, then the whole part may very easily be buckled and distorted to such [redacted] degree [redacted] will render it impossible for the upper surface to be accurately filed, scraped or similarly worked upon.

On the other hand, if only [redacted] very light gripping pressure is applied to the sides of the article to prevent such distortion it may well be that immediately vertical pressure is placed on the part by the file, or scraping tool, it will be pushed downwards and out of the jaws altogether.

The softer the material, and the smaller its gauge thickness the greater care will be required when gripping in this manner, and in the case of very thin components in aluminium, it might prove exceedingly difficult to attain the right degree of gripping pressure consistent with freedom from buckling, yet sufficient to hold the part against the tooling pressures.

Sometimes, of course, it will be possible to insert a small piece of wood underneath the sheet metal component, after it has been lightly gripped in the vice jaws. This wood block would, of course, serve as [redacted] supporting chock to prevent the sheet article from being pushed downwards out of the jaws when cutting pressure is applied to its surface.

If too great [redacted] degree of cutting pressure were to be applied, however, there would still be a great tendency for the strip to be bent upwards off the wood block, and thus it would be rendered difficult to file or scrape.

Moreover, it is worth while noting that before such a sheet metal component could be gripped in the ordinary bench vice at all, it must have two sides reasonably parallel with each other, and the length of these portions must be sufficient [redacted] obtain [redacted] adequate grip.

Components having sides which [redacted] tapered, curved, or irregular in shape, cannot, of course, be retained in the vice directly between its parallel jaws, and some other means must be adopted.

Makeshift Gripping Means

In order to obtain [redacted] grip of such irregular shaped components, and to circumvent the several undesirable occurrences mentioned above, the engineer will usually have to resort to a number of makeshift expedients, some of which [redacted] far from satisfactory, either in respect of safeguarding the original shape of the piece, [redacted] in the quality of the grip obtained, or in respect of the amount of time and attention needed to mount [redacted] workpiece in readiness for filing operations.

Using [redacted] Wooden Block

One of the simplest and most widely used dodges consists of gripping [redacted] rectangular piece of hardwood in the vice after the usual fashion, holding this in such [redacted] manner [redacted] to leave its upper surface projecting slightly above the top of the vice jaws.

The sheet metal component will then be attached to the top of this wood block by means of two or three small vee-head screws, if holes can be permitted through the workpiece. Failing this, the piece may be located and retained on the block by [redacted] number of small nails driven tightly into the block and located at suitably disposed points around the outline of the component. These nails would project slightly above the block but not above the top surface of the strip component being gripped.

These nails would have to be carefully located so that the piece would be firmly retained in place.

The drawbacks associated with this method will be readily apparent as follows.

Fresh nail locations will be required for each different shape of component to be gripped, and, therefore, if [redacted] variety of articles, each of [redacted] different outline form, have to be dealt with, the task of mounting successive pieces in the above [redacted] will prove protracted.

Secondly, if the component should be of [redacted] very irregular outline shape, then [redacted] large number of nails would be required to fix the part firmly in position.

Thirdly, such nails would have a tendency to bend or move out of place during the actual machining or hand filing operations and the sheet metal article would thus be able to move about with the action of the file. The part could not be rigidly held.

When mounting awkwardly shaped parts in this manner it may be found that the setting time far exceeds the actual cutting or filing time.

Affixing a Holding Shank [redacted] the Sheet Component

Another very common method adopted comprises the soldering of [redacted] mild steel block to one

side of the component. This block would preferably be of regular outline, capable of being easily gripped in the vice. Alternatively, such a block could be secured to the component by brazing.

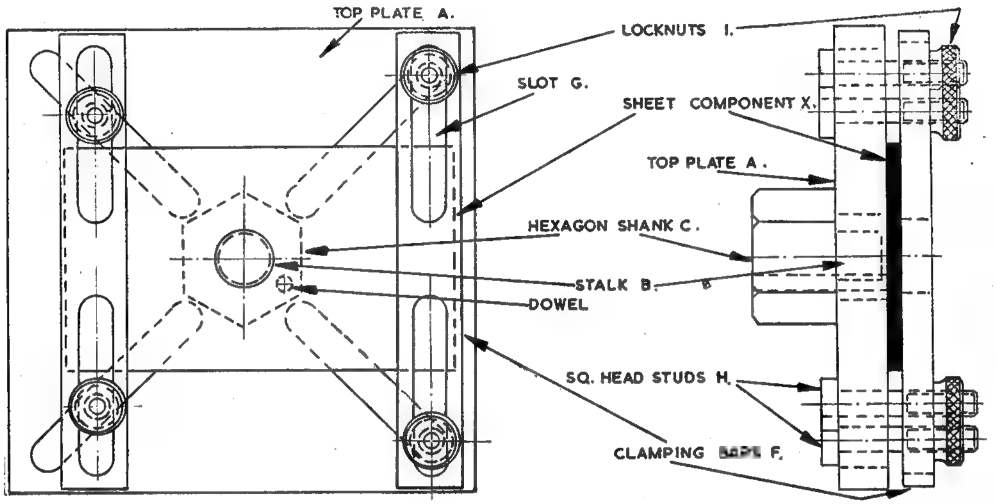
Here again, certain obvious limitations will arise. For instance, it will be possible to employ this method only if the components are made in steel, brass or copper, or similar easily solderable materials. Those in aluminium or zinc would present some difficulties.

materially simplify gripping operations of the kind and purpose described.

Two views of this device are shown, the one at the left being a plan projection of the completely assembled fixture, having a rectangular sheet steel component *X* clamped in the working position. The right-hand illustration is an end view projection of the fixture.

This holding device comprises the following simple component members.

A is the main top plate of the holder. This is



In any event, after such soldering, when the part has been suitably filed or machined, the soldered joint will have to be broken, and some kind of cleaning up will then be required on the opposite side of the piece to remove all traces of the soldered joint.

The time involved in first soldering, and then breaking the joint, and subsequently cleaning up the surface of the part, will often be much greater than the time needed to shape the piece during actual working stages.

Furthermore, with both these customary methods, the operator will be confronted with certain limitations in respect of the disposition of the workpiece in the vice. It would, for example, rarely be possible to turn the workpiece around to any desired lateral setting, as is often necessary and desirable during such operations as filing, scraping, or marking-off. It would be still more difficult to incline the workpiece out of the horizontal plane.

The position of the component would be determined largely by the shape and size of the block to which it was attached and the accessibility of this member to the vice jaws.

The simple type of auxiliary vice attachment depicted by the two diagrams shown above illustrates the unusual design and constructional features of a useful fixture whose application will

made from mild steel, and with the present example being described, this part was made exactly 6 in. sq. and approximately ⅜ in. thick.

It is essential that the top and bottom surfaces of the plate be perfectly flat and parallel with each other. These surfaces must be smoothly finished. Ordinary bright drawn steel bar stock would serve admirably for this component, and the only machining necessary would be the simple sawing-off operation.

A ⅜ in. diameter drilled and reamed hole is machined fully through the plate at the centre, and this hole should be exactly at right-angles to the face of the plate.

Fitted very tightly into this hole is the short cylindrical stalk, *B*, integral with one end of the hexagon shank, *C*. This member should preferably be made in mild steel, using standard bar size. The length of the hexagon portion of the shank may be made to any convenient dimension to suit the size of bench vice with which the holder will be used.

The shank, *C*, must be very securely affixed to the top plate, *A*, by rivetting the end of the stalk *B*, into a conical recess provided at the edge of the hole in the plate.

To prevent the top plate from accidentally being disturbed in a radial direction the hardened steel dowel, *D*, is employed, this being situated

in a plain hole drilled through both members as shown.

Four elongated slots, *E*, identical in width and length, are machined clean through the top plate, *A*. Each slot is located centrally with the true diagonal line of the squared plate as depicted.

Each slot is extended very closely into a corner of the plate, and at the other end is machined very close to the adjacent side of the hexagon shank, *C*, situated underneath the plate.

For retaining a workpiece in place on the top plate, *A*, two identically shaped clamping bars of the kind shown at *F* are employed.

These members, also made of steel, are in effect rectangular strips, and for the size of attachment here illustrated standard bar stock $\frac{3}{8}$ in. × $\frac{7}{8}$ in. was used.

Into each clamping bar two elongated slots, *G*, are cut. These are made perfectly straight and parallel sided, and are disposed centrally along the length of the part as shown. A portion of solid metal is left between these two slots approximately 1 in. in length.

The width of these slots, *G*, is made exactly the same as that of the elongated slots, *E*, in the top plate.

Each clamping bar is fastened to the top plate by means of two square headed studs or bolts, *H*, and the circular knurled lock-nuts, *I*, which screw on to the threaded shanks of the studs as shown.

The studs are passed through the diagonal slots, *E*, in the top plate and the slots, *G*, in the clamping bars, with their square heads on the underside of plate *A*, see end view at the right.

Method of Using the Holding Fixture

In the diagrams at Fig. 1, a thin sheet steel component, *X*, of rectangular shape is shown gripped in the working position.

It will be observed that this component is situated approximately centrally on the top plate, and is retained simply by fixing the two clamping bars, *F*, on top of the component. These bars are located wide apart so as to bear upon the end portions of the strip.

The component will be locked merely by tightening the lock-nuts, *I*, thereby pressing down the clamping bars until the workpiece is firmly clamped to the top plate.

The whole fixture will, of course, be previously gripped in the bench vice by means of the hexagon shank, *C*, on its underside. By allowing the top plate to rest upon the top of the vice jaws the fixture may be instantly mounted perfectly level, and moreover, it will be prevented from moving downwards when filing or other operations are conducted on the component.

Advantages Derived from Use of Holder

From these brief design and constructional details it will be understood that a thin sheet workpiece, otherwise very apt to bend and flex, will receive a stiff and rigid support on its underside when mounted in this holder.

The component will also be prevented from lifting, or shifting about on the top plate because of the pressure exerted by the two clamping bars.

These latter members may be adjusted very quickly in order to impart a powerful locking pressure on the piece, which clamping action will be found sufficient to withstand the heavy filing or scraping pressures.

In actual practice the writer has used a fixture according to this design in conjunction with the usual type of machine vice, it being found that sufficient clamping pressure may be applied to a workpiece to resist the heavier cutting pressures when milling or drilling the component. If a greatly additional locking pressure is desired this may easily be obtained merely by using ordinary hexagon lock-nuts in place of the circular knurled nuts, *I*.

Because of the diagonally disposed slots in the top plate and the elongated slots in the clamping bars these latter may be swung around to practically any angle relative to the sides of the top plate to suit the shape of the component being gripped. This provision will be found of the greatest convenience, especially when having to clamp a piece which can only be gripped at one or two isolated points, and not across its whole width.

With such a construction components of widely different shapes can easily be clamped simply by altering the positions of the clamping bars. The studs, *H*, will, of course, move along the respective slotted portions in the top plate and the bars themselves to allow for such settings.

The whole fixture may be readily gripped in the vice jaws in any of six positions simply by using different flats of the hexagon shank, *C*.

If this latter member is made sufficiently long, the entire fixture may be raised out of the vice a sufficient distance to allow it to be tilted at any desired angle to facilitate still further the filing or other operations to be performed.

A fixture of this construction, and made to the sizes here given, will deal with a very large variety of sizes and shapes of component.

It is also possible to grip the article in such a manner as to leave the major portion of its surface area completely free.

Parts can be very quickly mounted or extracted from the holder.

The top plate, shank and clamping bars should be case-hardened before final assembly in order to give longer working life, and to maintain the accuracy of the holder.

It is not necessary to machine screw holes, etc., through the sheet metal workpiece as with previously mentioned holding methods.

It was also found in practice that parts can be gripped quite safely in a device of this kind without producing distortion or buckling of the surfaces. This feature will be found particularly helpful in the case of components made out of very thin section materials.

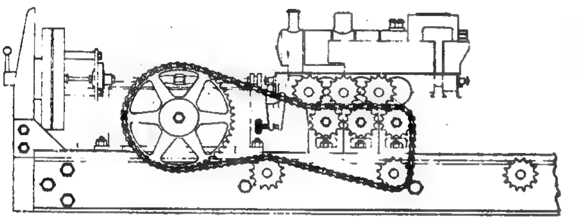
In the case of highly polished workpieces the surface finish may easily be protected merely by interposing a sheet of paper, or thin cloth between the work and the top plate before the part is clamped in position.

A fixture or this kind will prove one of the most valuable and handy devices for bench vice work generally, and it is inexpensive to manufacture. If extremely large components have to be handled in this way it would, of course, be necessary to make the device correspondingly larger in surface area and to use thicker section steel pieces.

The Efficiency of Small Locomotives

by G. W. Wildy, A.M.I.Mech.E.

THE columns of THE MODEL ENGINEER have, for a number of years, contained letters and articles on the above subject, and many contributors have presented well-reasoned arguments and deductions about the probable efficiency of small locomotives, as well as ways and means of measuring this efficiency. The latest letter from Mr. Nightingale on this subject much in mind when the trials about to be described were being planned. To avoid any misunderstanding, the writer has called this concept of efficiency the "Draw-bar thermal efficiency", a term which will be readily understood by engineers and which was applied before Mr. Nightingale's and "Arty's" recent contributions appeared in print.



TYPE	LMS Princess Royal	LMS Dockyd Tank
CLASS	7P Class 4-6-2	2F Class 0-6-0
GAUGE & SCALE	5" 1 1/16" = 1 ft	2½" 17/32" = 1 ft
LENGTH O'ALL	52¼"	14½"
COUPLED W'BASE	8½" + 7¾"	2½" + 2½"
O'ALL W'BASE	40"	5"
WEIGHT	200 lbs	12 lbs
DRIVING AXLE LOAD	60 lbs	4 lbs
TRACTIVE EFFORT	75 lbs	2 lbs
MAX SPEED	15 mph	5 mph
DB HP @ MAX SPEED	3 hp	1/38 hp

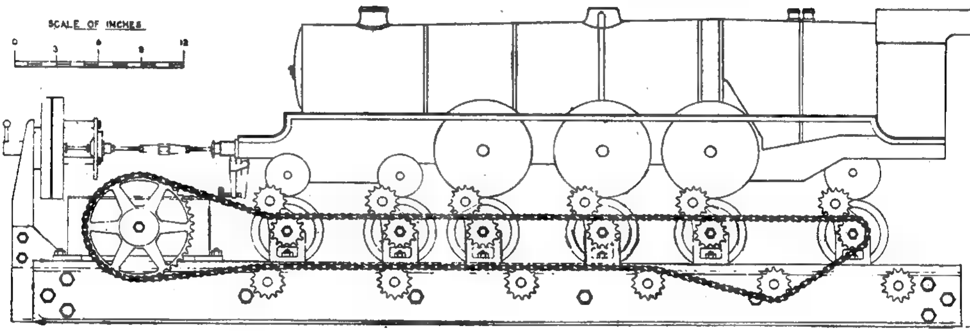


Fig. 1

and the invitation by "Arty" in the issues dated 13th April and 4th May, 1950, respectively have, however, prompted the writer to offer the following results of some trials conducted by S.M. & E.E. members. In so doing, the writer is well aware that the figures prove nothing at all, in fact—for reasons given later—the figures must be treated with reserve until some further trials have been conducted to check one or two apparent inconsistencies. If the figures serve to stimulate discussion the purpose envisaged by "Arty" will have been served.

As was clearly shown by "Arty" and Mr. Nightingale's letter—already referred to above—the conception of overall efficiency as given by the ratio of "work got out" to the "work put in" is a very good criterion; and as Mr. Nightingale has already dealt so faithfully and well with this concept it would be tedious to repeat it here. It is sufficient to say that this efficiency was very

Before proceeding to give the performance curves, it will be convenient to state, at this stage, that the trials were *not* conducted on the track, but upon the Society of Model and Experimental Engineers' locomotive test stand. Old readers of this journal may recall that the late G. S. Willoughby made a powerful plea some fifteen years ago—page 62, Vol. 74 of THE MODEL ENGINEER refers—that the S.M. & E.E. should construct a test stand for the purpose of collecting and publishing data about the performance of small locomotives, but it was not until 1948 that the S.M. & E.E. Council decided to embark upon the design and construction of a locomotive test stand to mark the occasion of its Jubilee. To readers who may not have seen this stand at the Society's Jubilee Exhibition or at recent "Model Engineer" exhibitions, Fig. 1 will give some idea of the size and capacity of the test stand.

Some Difficulties

Although the test stand, when originally conceived, was thought to have many advantages in that :

(i) it enabled locomotives to be run at constant speeds without the driver and/or tester being subjected to the strain of keeping a watchful eye on the track, and,

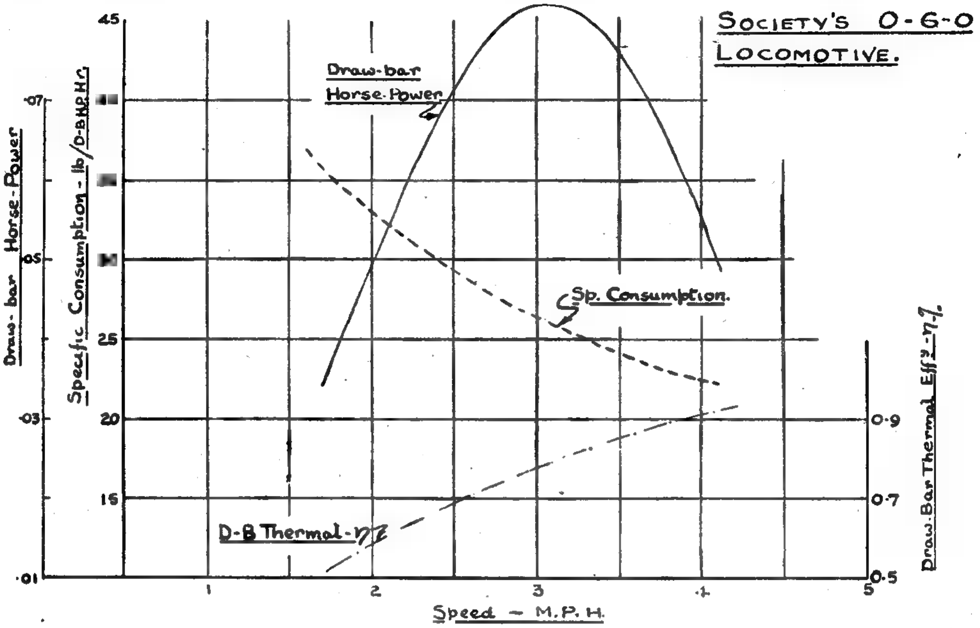


Fig. 2

(ii) made the measurement of draw-bar pull a fairly straightforward operation ; it has been found, in practice, that violent slipping is likely to occur when the locomotive is heavily loaded, and it is for this reason that caution must be exercised before the figures quoted are regarded as absolute.

This question of adhesion was foreseen by "Arty," and is one that requires further consideration, and the suggestion that artificial aids to adhesion shall be applied is one which should be fairly easy to apply. To increase the adhesion without adding artificial loads to the driving wheels is, however, a problem which does not seem capable of immediate solution because the rollers upon which the locomotive driving wheels rest, tend to wear smoother as the test proceeds, and the smallest drop of oil will start slipping. Consequent racing of the locomotive's wheels and motion work will, in turn, induce more oil to be flung on to rollers, thus making matters even worse. With care on the part of the driver when the initial oiling up takes place before the test, and the judicious application of carbon-tetrachloride to the rollers by the tester as the test proceeds, it is possible to reduce the tendency to slip.

Actual Results

It has not been thought necessary to reproduce the actual readings taken throughout the trials on the test stand, but rather to present readers with the curves which have been deduced from the figures observed during the trials. To assist those who may wish to compare the performance of the model with its prototype, the following tabular statement of the leading particulars of each locomotive tested is given :—

Owner	S.M. & E.E.	Dr. Robinson
Locomotive ..	"1928"	"Gladstone"
Wheel Arrangement	0-6-0	0-4-2
Valve Gear ..	Joys	Stephensons
Gauge	5 in.	5 in.
Nominal Boiler Pressure ..	90 lb/sq. in.	75 lb./sq. in.
Diameter of Drivers	4 in.	7⅛ in.
Number of Cylinders	2	2
Bore	1¼ in.	1 9/32 in.
Stroke	2 in.	2¼ in.
Full Gear Cut-off..	75 per cent.	Not known
Calorific Value of Fuel	14,500 B.Th.U.'s per lb.	

The performance curves are given at Figs. 2, 3, 4 and 5.

The first two curves—at Figs. 2 and 3—are straightforward and need little explanation, although it should be noted that the "specific consumption" quoted on these two sets of curves is the specific *fuel* consumption. There is one curious fact, however, in connection with Figs. 2 and 3 which has caused the writer some speculation, and that is the speeds at which maximum power is developed. From a consideration of the dimensions of the driving wheels and lengths

of strokes, it will be found that this maximum power is developed at [redacted] piston speeds of the following order :—

"1928" .. .. 77 ft. per min.
"Gladstone" .. 88 ft. per min.

These mean piston speeds seem very low—even allowing for the fact that the small locomotives do not represent the latest ideas in modern express locomotive design. (For the benefit of readers who do not know these locomotives intimately, it must be stated that these locomotives were built by competent locomotive constructors, so the question of faulty workmanship does not arise.) Perhaps the correspondents who contributed to the recent discussion on [redacted] and sizes of cylinder ports can explain these low piston (or steam) velocities.

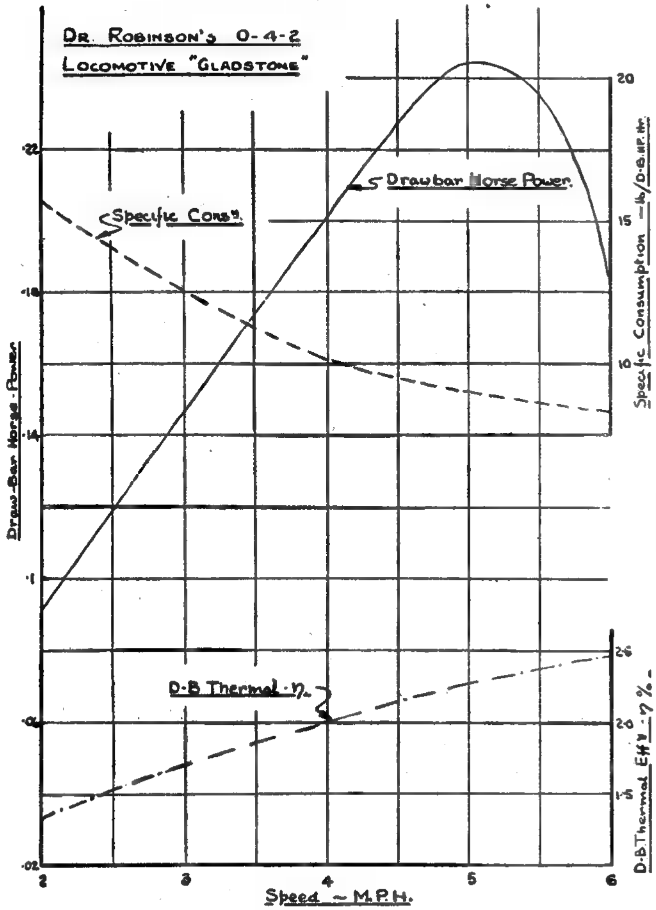


Fig. 3

Referring to the curves shown [redacted] Figs. 4 and 5 and which are primarily concerned with boiler outputs and efficiencies, it will be seen that the average specific water—or steam—consumption of [redacted] Gladstone [redacted] is nearly three times the accepted figure of about 27 lb. per d.b.-h.p. hour for [redacted] modern express locomotive. The reader is warned against accepting the water consumption figures obtained for "1928," as excessive feed pump leakage during the test makes the water consumption figures suspect, in spite of the tester's efforts to deduct the water that did not go into the boiler! The high steam consumption per unit of work done may be due to heavy condensation and radiation losses which are relatively higher in [redacted] model than in the full-sized prototype —yet another example of "L.B.S.C.'s [redacted] dictum that "nature cannot be scaled."

Conclusions

Notwithstanding some of the apparent shortcomings of the small locomotives in respect of steam utilisation, it [redacted] that there is no doubt—as has frequently been stressed by [redacted] L.B.S.C."—that the small locomotive boiler is easily able to deliver all the steam required by the cylinders provided reasonable distribution of the steam is assured by well designed and well constructed valve-gears. Even if the fuel and water figures for [redacted] 1928" are disregarded as being unreliable, the writer is fairly confident that those for [redacted] Gladstone" are not too wide of the mark and on this basis the boiler performance of this small locomotive compares very favourably with its full scale counterpart.

Although the trials have opened up many interesting avenues for further research, the writer feels that the present test stand lacks one important facility which is available to every engineer dealing with full-sized prototypes, and that is the lack of provision for measuring the indicated horse-power. As most readers know, indicated horse-power is computed from the well-known formula :—

$$\text{I.H.P.} = \frac{2\text{Pm.L.A.N}}{33{,}000}$$

and in full-size practice, the term Pm (mean effective pressure), is deduced from the indicator diagram. The indicator diagram is, of course, [redacted] valuable means of ascertaining how well the steam has actually performed its work in the cylinder, and gives many valuable clues about the correctness of the valve setting. Unfortunately, one is not able to couple [redacted] full-sized indicator to even [redacted] 5-in. gauge locomotive's cylinders without seriously impairing the validity of any diagrams which might be taken, since the steam volume of even the smallest commercial indicator—assuming it is of the piston variety and not [redacted] form of diaphragm or Hopkinson indicator—is likely to be very large compared with the swept volume of the locomotive cylinder. Even if

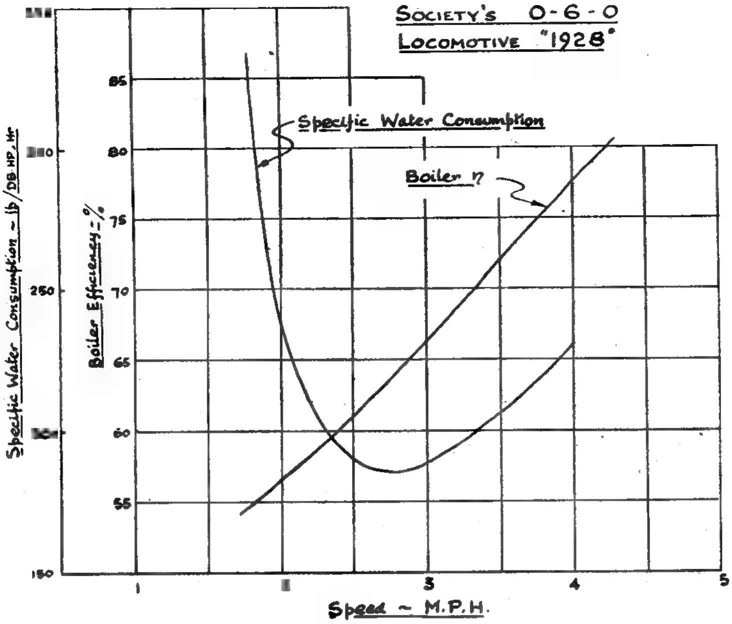


Fig. 4

electronic or diaphragm-type indicators are used it is difficult to see how they could be rigged without dismantling half the locomotive.

An indirect way of measuring i.h.p. would be to motor the locomotive around by means of [redacted] suitable electric motor and mea[redacted] the power required to do so. Since this power would be the power required to overcome all the frictional and other mechanical losses inherent in the locomotive, it is clear that if this power is added to the d.b.-h.p. (equivalent to b.h.p.) the result will be the i.h.p. the engine is developing. The term Pm is then deduced from the formula mentioned above. It has not yet been found possible to try out this idea—largely due to the many calls on the writer's spare time—but [redacted] effort will be made to do this in due course.

Summarising, the writer would suggest that the locomotive bench trials have shown that :—

(i) the average small locomotive's boiler is nearly [redacted] efficient [redacted] its prototype ;

(ii) measurement of maximum power at speed is very difficult to achieve, due to slip between the

(*Continued* [redacted] *page* 445)

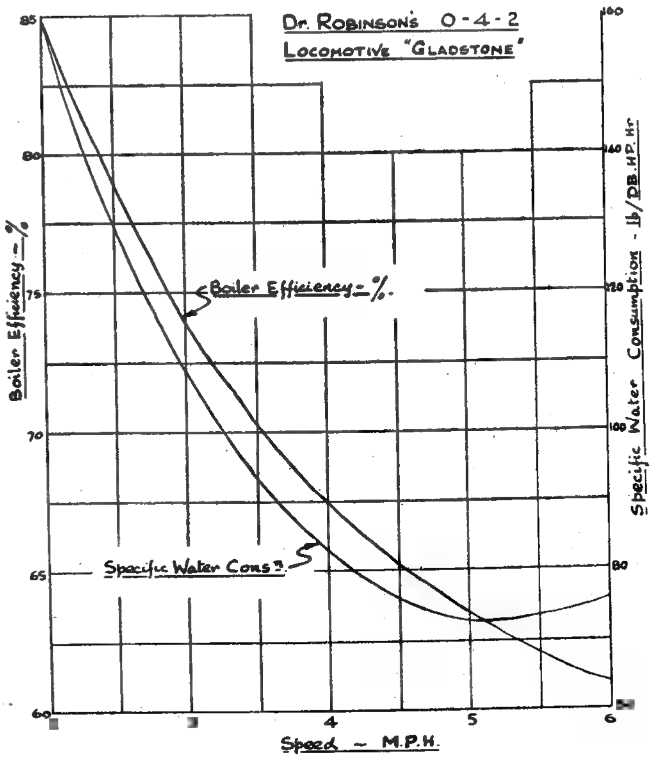
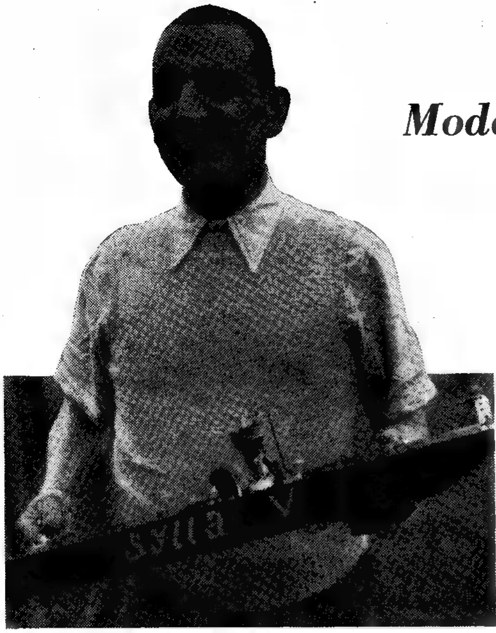


Fig. 5

International Model Power Boat Racing



M. Suzor with his latest " C " class boat " Sylla V "

THE races for the Hispano-Suiza and Ford trophies were held at Allestree Park, Derby, [redacted] a recent weekend. Both of these trophies were held by G. Stone (Kingsmere and Derby) who was successful in Paris and Geneva last year. This was the first two-day event held in this country for model speed craft, and it is also the first time that competitors from Switzerland have visited this country.

The regatta was held under the auspices of the M.P.B.A. and organised by the Derby M.R.C. Messrs. E. Clare and G. Stone bearing the major part of the preliminary work that such [redacted] event entails. Thanks to the generosity of Sir Robert Bland Bird, who contributed handsomely towards the financial aspect of the regatta, there were many fine prizes to be won besides the main trophies. Several firms, notably: Messrs. Hispano-Suiza, Messrs. Phenoglaze, Messrs. Rowell, Messrs. Wakefield, Messrs. K.L.G. and Messrs. Albon, also contributed to prizes.

The regatta was due to begin on the Saturday, at 2 p.m., with the race for the Hispano-Suiza Trophy, and promptly to time the regatta was declared open by Lady Bird who, in her short speech, wished all competitors the best of luck.

The Mayor and Mayoress of Derby were also present and stayed throughout the day.

It has to go on record that the clerk of the weather had decided to show our visitors what [redacted] real English summer is like! In other words, it drizzled with rain practically all day, and this damp atmosphere affected most of the boats present—in fact, several boats even failed to start. It [redacted] noted that engines running on glow-plug ignition and methanol fuel were affected by the wet more than the spark-ignitioned boats.

The Derby club had provided [redacted] marquee for the visitors and competitors, so that in spite of the weather it was possible to run the regatta off, although many boats failed to get [redacted] run at all either due to the poor conditions or exceeding the strict time limit allowed on the line. The time limit was necessary due to the large entry (27 boats). Among the competitors failing to complete the course with his craft, was the holder of the trophy, G. Stone, who [redacted] running several other boats besides *Lady Babs* in this race. *Lady Babs* and *Rodney* both petered out on the occasions they were successfully started.

The Swiss competitors—Jean-Louis and Pierre Chevrot—were each running two boats. All the Swiss craft are Hornet-engined and fitted with magnetos, which appear to be very efficient. These boats have obviously been developed to a very fast and reliable performance, but starting trouble was evident, even so. However, P. Chevrot with *Be-Bop II* and J. L. Chevrot with *Folbrise VI* both managed one run each to fill first and second places at over 60 m.p.h. The youngest competitor, C. Stanworth (Bournville), took third place with *Meteor IV* [redacted] 54.35 m.p.h. Incidentally, the M.P.B.A. rules regarding silencers had been relaxed for this regatta by arrangement with the Derby Corporation so that some boats gained a few m.p.h. over their usual regatta performances.

It is interesting to note that only one boat, R. E. Mitchell's *Gamma*, succeeded in completing the course on both runs, and of the total entry only eight returned a time.

Gems Suzor (Paris) ran [redacted] new boat, *Sylla V*, which had no sponsons, running on one narrow plane, but this arrangement did not appear to be any too stable. *Sylla V* managed to complete the course on one run, however, recording 41.7 m.p.h.

A table is shown giving the first six places of the main event and also the various handicap prizes, etc.

In the evening [redacted] dinner was given by Sir Robert Bland Bird to all competitors and wives and other visitors, which included the Mayor and Mayoress of Derby and, of course, Gems Suzor and Pierre and Jean-Louis Chevrot and Mlle. Bianca and Mme. Chevrot. After toasts and responses by the various notables present, the prizes for the day's racing were presented by Lady Bird amid great enthusiasm.

On the following day the " Ford Mechanics Cup " [redacted] contested by some 40 different boats. This trophy is won by the fastest boat in any class, and again the three-minute time allowance

HISPANO-SUIZA TROPHY for 10 c.c. Hydroplanes

Owner	Boat	Club	Best Run	Place	Handicap Place	
			m.p.h.			
P. Chevrot	*Be-Bop II*	M.R.C. Geneva	63.91	1st		
J. L. Chevrot	*Folbrise VI*	M.R.C. Geneva	60.87	2nd	4th	
C. Stanworth	*Meteor IV*	Bournville	54.35	3rd	1st	Fastest all-British boat prize
E. Clare	*Imshi II*	Derby	54.09	4th	3rd	
R. E. Mitchell	*Gamma*	Runcorn	48.7		2nd	
G. Suzor	*Sylla V*	M.Y.C. Paris	41.74			

Mr. C. Stanworth (centre) with the Chevrot Bros.

was necessary as that the racing would end at a reasonable time.

The weather on this day was, happily, very much better; no rain, and the sun shone for most of the day.

The Class "A" and "B" hydroplanes were the first to run, these boats using a heavier tethering wire than the 10 c.c. boats.

One of the earlier craft to show their paces was *Ifit 7*, the latest of the line of famous flash-steamers to bear this name, and everyone stood and applauded as *Ifit 7* fairly tore round the course, attaining about 60 m.p.h. Unfortunately, a valve seized up before five laps could be completed after the timing signal had been given. This caused *Ifit 7* to be withdrawn from the race.

Another Class "A" boat to do well was K. Williams *Faro*, which recorded 53.55 m.p.h.

Upon the 10 c.c. boats' turn to run, the line was changed for a lighter wire having an extension of 2 ft. 6 in. that could be easily removed, thus allowing either the British or Continental bridle to be used. The Swiss competitors again did very well, although the fastest speed put up was slightly lower than the best of the previous day, However, the first three places were filled by their boats, as can be seen in the table showing the first 14 places. Gems Suzor could not get in a run with *Sylla V*, and, repeating his bad luck of the Saturday, G. Stone also failed on all attempts, although *Lady Babs II* showed amazing speed for three-quarters of a lap before climbing almost vertically. Another boat to have bad luck was G. Lines' *Sparky II* (15 c.c.)

Mr. A. W. Cockman starting the latest of the "Ifits"

FORD CUP—All Classes

Owner	Boat	Club	Best Run	Place	Handicap Place	
			m.p.h.			
J. L. Chevrot	*Folbrise VI*	M.R.C., Geneva	61.97	1st		
J. L. Chevrot	*Diabolik*	M.R.C., Geneva	59.45	2nd		
P. Chevrot	*Be-Bop II*	M.R.C., Geneva	56.5	3rd		
K. G. Williams	*Faro* (A)	Bournville	53.55	4th		Class " A " prize
R. A. Phillips	*Foz* (C)	S. London	52.41			
N. Ridley	*Marie* (CR)	S. London	50.62			
C. Stanworth	*Meteor IV* (CR)	Bournville	48.47		4th	
R. Mitchell	*Gamma* (C)	Runcorn	46.91		3rd	
R. Mitchell	*Beta II* (B)	Runcorn	46.06			Class " B " prize
F. Jutton	*Vesta II* (B)	Guildford	44.85			
T. Daziel	*Naiad II* (B)	Bournville	43.51			
A. Brierley	*Bitza II* (CR)	Derby	42.43		1st	
W. Parris	*Wasp III* (A)	S. London	41.57			
W. Churcher	*Annette II* (B)	Coventry	39.63		2nd	

which has attained very high speeds recently in practice runs; this time the first run was around 39 m.p.h. and on the second run *Sparky II* capsised at over 60 m.p.h.

It should not be inferred from the results that the British boats were outclassed, as some very promising performances were seen even though the runs were incomplete.

At the prize-giving, Lady Bird again officiated and the various winners received handsome prizes, all Continental visitors receiving a pack of bridge cards as a souvenir, in addition to their cups and other prizes. G. Stone received a hard luck prize, and the Chevrot brothers and Gems Suzor asked that he would have a try at a demonstration run after the prize-giving.

As is usually the case, *Lady Babs II* did everything that it would not do in the actual regatta! On two runs 72 m.p.h. was exceeded for five laps without trouble.

This spectacle ended the largest event for hydroplanes ever held in this country, and it is hoped that J. L. and P. Chevrot will visit us many more times, besides, of course, Gems Suzor. During the regatta the B.B.C. television cine-cameras were busy and no doubt many readers saw the results of their work on the television screen.

The Efficiency of Small Locomotives

(*Continued from page* 442)

locomotive drivers and test bench rollers;

(iii) the condition, or quality, of the steam entering the steam chests is something of a mystery in spite of superheating, and finally,

(iv) consequent on (iii) above, possibly, the steam consumption of a small scale locomotive is higher for a given unit of work than that accepted in full-size practice, and if a satisfactory explanation can be found for this state of affairs, it will explain why the model " Gladstone's " thermal efficiency is only about one-third that of its prototype.

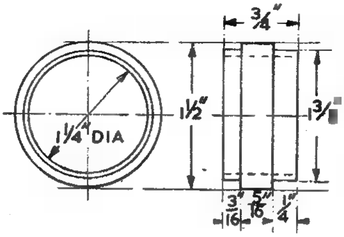
In conclusion, it must be confessed that the more one studies the results obtained, the more evident does it become that a great deal of further research and testing must be done before any practical suggestions can be made for the improvement of the average small scale locomotive. Hitherto, it has not been found practicable to conduct a comprehensive series of tests on the S.M. & E.E. test bench due to the congestion that existed in the society's premises at Nassau Street. The removal of the society's headquarters and the provision of a test room at Wanless Road, Brixton, have at long last provided an opportunity for the experimentally-minded members to conduct some trials of a fundamental nature, and the writer hopes that further results will be available in the not too distant future. If readers desire it, and with the Editor's permission, the writer will be pleased to furnish any figures so obtained.

The writer thanks the Chairman and Council of the Society of Model and Experimental Engineers for permission to publish Figs. 1 to 5.

"PAMELA" by "L.B.S.C."

A 3½-in. Gauge Rebuild of a Southern Pacific

As far as actual work is concerned—that is, brazing joints, silver-soldering tubes, staying, and so on—there isn't much difference between the boilers for *Pamela* and *Tich*; and those inexperienced workers who are building the bigger engine, can get plenty of useful detailed information from the notes on the smaller one. However, the personal anatomy of the respective boilers is somewhat different, apart from the size; and the following notes should help *Pamela* builders to do their bit of boilersmithing with the least amount of trouble. First of all, the firebox crown and sides, and the whole of the combustion-chamber, are formed from [redacted] single sheet of 13-gauge or 3/32-in. copper, approximately 13¾ in. × 11¼ in. If this is supplied in the bright hard-rolled grade, soften it before attempting to bend it to shape. The "text-book" way to cut the sheet is to mark out on it the outline of the whole issue, by calculation, and then cut away the unwanted parts, before doing any bending. Inexperienced coppersmiths will probably find it easier to bend it to shape first, except for making the two side cuts necessary to form the combustion chamber to the given shape. If the former method is adopted, the "paper pattern" will once more be found very useful for getting the exact shape of the piece of copper required, without any calculation being needed.



SQUEEZE OVAL AFTER TURNING

Firehole ring for "Pamela"

As before, use [redacted] piece of thick brown paper cut to the size given above. At 4⅝ in. (length of combustion chamber) from both sides of one of the longer ends, make a snip with the scissors, parallel to the end, and 4½ in. long. Bend the whole lot to the shape of the firebox, [redacted] shown in the cross section; then continue bending the 4⅝ in. pieces till they overlap to form the combustion chamber. Snip enough off each of the overlaps, to allow for [redacted] lap joint ½ in. wide, when the combustion chamber measures 4 in. × 2⅝ in. Fix the overlap with pins, paper fasteners, gum, paste or any old thing you may have handy.

Next, at 1¼ in. from the bottom front edge of each side of the firebox, nearest to the combustion-chamber part, make [redacted] pencil mark; and from that point, cut off each corner, aiming the scissors at the level of the bottom of the combustion chamber, see cross section. This will give you the correct slope of the front end of the firebox. After that, mark a point ⅝ in. from the bottom of the back end of the firebox part, at each side; snip along from the bottom front [redacted] to this mark, and you then have the correct slope of the bottom of the firebox. Finally, at the top, where the firebox sheet curves over to form the crown, mark a spot ⅞ in. from the end. Cut up to this from the bottom back corners, and then cut straight across the top, from one side to the other; this gives the shape of the back end of the firebox. All that remains, is to unfasten the lap joint at the bottom of the part forming the combustion-chamber; lay the sheet of paper flat on [redacted] piece of 13-gauge soft copper sheet, mark all around the paper pattern, and cut the copper to the same shape and size.

The sheet of copper can then be bent in exactly the same way as the pattern, using a bar in the vice, as described for the wrapper sheet. First, bend to the shape of the firebox, then continue until the part forming the combustion chamber, is of the shape shown, with ½ in. overlap at the bottom. Put a few 3/32-in. copper rivets through the lap joint, to keep it set whilst the brazing is in progress.

If it is preferred to dispense with [redacted] paper pattern and cut the copper after bending to shape, take [redacted] piece of 13-gauge copper of the size given above, and cut the two side snips at 4⅝ in. from one of the long ends, as described for the paper pattern. Bend the whole lot to shape of firebox, then cut off the excess on each side of the combustion-chamber portion, which will be approximately 1 in. at each side. Then finish bending up the remainder, to the shape of the chamber; lap and rivet the joint. The rear end of the firebox, and the front corners, can then be cut away to the angles shown. The best weapon for that job is [redacted] fairly fine-toothed hacksaw, with plenty of cutting oil on it. Trim off any ragged-[redacted] with [redacted] file.

The front end of the firebox, below the combustion chamber, is closed in by what is merely [redacted] glorified edition of the *Tich* throatplate, made and fitted in exactly the same way. The size of the piece of copper needed, is approximately 6 in. × 4¾ in., and the thickness 3/32 in. or 13-gauge. Flange each side first, nick flanges and bend it [redacted] described for throatplate, then put it temporarily in position, [redacted] described for the *Tich* throatplate; then put [redacted] scriber down the combustion chamber and scratch a line [redacted] the plate, close to the curve of the combustion chamber. Remove, saw out the half-moon-shaped piece, clean all contact surfaces, and replace, securing with [redacted] few copper rivets at each side, through both the flanges and the firebox side sheets. The flanges should just

overlap the ends of the cuts between the firebox and combustion chamber, as shown in the longitudinal section of the boiler. At first sight, these appear to a novice, as though the firebox and combustion chamber were separated by a flanged plate; but actually, the flanges are only at each side, the central part being cut away, as described above, leaving the opening from firebox to combustion chamber free and unobstructed in any way.

A former-plate will be needed for the door-plate of the firebox. This should be sawn from $\frac{1}{4}$-in. iron or steel-plate, unless our advertisers market cast-iron formers. The dimensions are as given in the cross section, less $\frac{3}{16}$ in. all around, except at bottom. The top edge isn't square with the back and front, but filed off at an angle, as shown in the longitudinal section. Cut out and flange the plate, from 13-gauge copper, exactly as described for *Tich*; then fit the firehole ring to it. This is made from a piece of $1\frac{1}{2}$ in. copper tube, with $\frac{1}{8}$ in. walls, and $\frac{3}{4}$ in. long. Turn a step on each end, as described for *Tich*, soften it, squeeze oval in bench vice, lay it on the doorplate with its centre $1\frac{1}{2}$ in. from the top, and take care it is in the middle. Scribe a line all around, cut out the piece, and fit it as described for *Tich*; the doorplate can then be riveted in position, with just enough 3/32-in. copper rivets to hold the plate to the flanges for brazing.

Combustion Chamber Tubeplate

This also requires an iron former, either cast, or cut from $\frac{1}{4}$-in. plate. In the latter case, merely stand the combustion chamber end-up on the iron or steel plate, and scratch a line all around it, as the former is the same size as the end of the chamber. Saw out, trim up with a file, round off one edge, and set out the location of the tube holes on it, as shown in the illustration. Centre-pop, and drill a No. 40 hole at each point. Lay the plate on a piece of 13-gauge copper, scribe a line all around $\frac{3}{8}$ in. from edge of former, cut out the copper, well anneal, and flange up. Before removing the former from the tubeplate, poke the No. 40 drill through all the holes, and the copper plate as well; remove former, open out the smaller holes with 27/64-in. drill, and ream $\frac{7}{16}$ in.; open larger ones (top row) with 47/64-in. drill, and ream $\frac{3}{4}$ in. Note—only use the "lead" end of a parallel reamer, as the tubes should fit tightly in this plate. Countersink the holes on the side opposite to flange. The completed plate should be a tight fit on the end of the combustion-chamber.

Watertubes

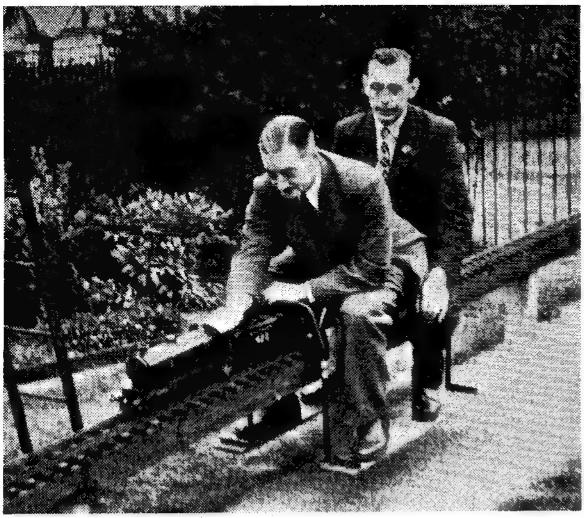
The vertical tubes not only stay the chamber, but they add considerably to the heating surface in the most valuable part of the boiler, and make the water "step lively." They are of more value than the syphon in the firebox of the full-sized spam cans, and require no staying like the syphon. Scribe two lines down the top of the combustion-chamber, $1\frac{5}{8}$ in. apart; put the "lid" on, and at $\frac{15}{16}$ in. from the end, make a centre-pop on both lines. The others are spaced at $1\frac{3}{8}$ in. behind, as shown in the longitudinal section. On the bottom of the chamber, scribe the lines $2\frac{1}{4}$ in. apart, and make the centre-pops at same front-to-back spacing. Drill a $\frac{1}{8}$-in. pilot hole at each point, open out with 19/64-in. drill, ream $\frac{5}{8}$ in., and countersink all the lot. Drive pieces of $\frac{5}{8}$-in. $\times$ 16-gauge copper tube through each pair of holes, letting the tube project about $\frac{1}{8}$ in. from the chamber at top and bottom. They are filed almost flush after the brazing job has been carried out.

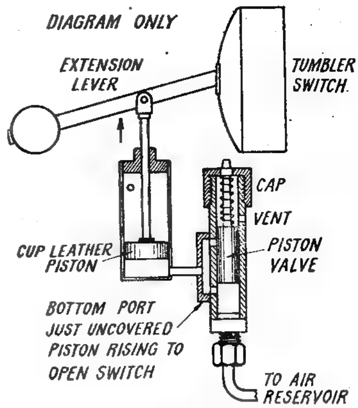
There isn't much to dilate on, about the crown stays, which are of the plate girder type that I have found so effective in practice. The two side stays are made up from pieces of sheet copper, 16-gauge, bent channel-shape (see cross section) and riveted back to back. The flanges are $\frac{3}{8}$ in. wide, both top and bottom, and the depth is $1\frac{7}{8}$ in., the length of the bottom flanges being 6 in. and the top flanges $5\frac{1}{2}$ in. Note that the front ends are vertical; only the back ends slope from top to bottom. They are riveted to the firebox crown-sheet by 3/32-in. copper rivets at $\frac{3}{4}$ in. centres, the centre lines of the stays being $1\frac{3}{4}$ in. apart.

The central stay is also made up from $\frac{1}{16}$-in. copper sheet, two pieces 6 in. long and $1\frac{5}{16}$ in. deep being bent to a right-angle at the bottom, and riveted together as shown. The top is arched, and the back end sloped off, as shown in the longitudinal section. This girder is riveted to the firebox crown sheet, midway between the other two. A series of $\frac{3}{8}$-in. holes, is next drilled clean through the whole lot, at the spacing shown. This will be found quite easy if a small pilot hole, $\frac{1}{8}$ in. or thereabouts, is drilled first, and the $\frac{3}{8}$-in. drill used afterwards. If the holes come out polysided, through the drill chattering or from any other cause, it doesn't matter a bean.

Second Brazing Job

The whole assembly can now be brazed up; and as this is carried out in the same way as detailed for the little *Tich* firebox—except that it will need a five-pint blowlamp, or equivalent air-gas blowpipe, and lots more perspiration on the operator's part—there is no need for repetition. Do the door-plate first; then, as the combustion-chamber tubeplate will be resting on the coke, go around the flange of that. Then have a go at the crownstay flanges and the upper ends of the water tubes, after which it can be turned up the other way, with the combustion-chamber pointing to the stars, and the front-plate flanges attended to, also the joint between front-plate, and the lower part of the combustion-chamber. Finally, lay the asembly on its back, and do the lower ends of the tubes, and the longitudinal seam. Alternatively, the whole process can be reversed; it doesn't matter which road you take, as long as you get there. Don't forget to run a little coarse-grade silver-solder along the crown-stay flanges, before using the brazing strip, as this will sweat through, and seal the rivets. Make absolutely certain that the brazing material runs clean around the tubeplate flange and leaves a fillet, also around the projecting ends of the water-tubes, for it is decidedly awkward if a Welsh vegetable begins to sprout in either place, after the whole issue has been "boxed up for keeps" in the boiler shell. Pickle, wash, and clean off, as previously described.





Quick-action compressor governor

Left—Old "Ayesha" shows the North London S.M.E. that she still can do the job!

I replaced the burnt switch in the waterproof box, with another of similar pattern, but a bit quicker on the opening and closing, and fitted a weighted lever to the extension handle outside the box. A small vertical piston-valve (3/8 in. diameter) was connected to the operating cylinder, the upper end being fitted with a spiral spring, which could be regulated by a screwed cap on the liner. The bottom port was connected to the cylinder operating the switch, and the upper port left open to atmosphere via a hole drilled in the liner. The lower end of the liner was connected to the air tank on the signal, by a 3/16-in. pipe and union.

The action is as follows: when the weighted lever is down, the switch is closed, and the motor starts. When the air pressure reaches 25 lb. the piston-valve rises against the pressure of the spring, uncovers the post, and admits air to the main piston, which shoots up and cuts out the motor by opening the switch. When the pressure in the air tank drops just below 20 lb., the spring takes command, pushes down the piston valve, cuts off the air, and opens the main cylinder to exhaust. Down flops the counter-weight, smacking the switch in again, and restarting the motor. On first run after installing, the above gadget kept the air tank between 20 and 25 lb. for 2½ hours without a hitch, and has been O.K. ever since.

The Popular Locomotive

The steam locomotive in miniature, is perhaps, the most popular subject in the whole field of model engineering; this is clearly apparent in all departments of our business, and he would be a brave man who attempted to disprove it! There are many clubs in Britain and America whose sole interest and pleasure is in the construction and operating of miniature steam locomotives. But there is also plenty of evidence that, in most clubs devoted to model engineering generally, the steam locomotive claims first attention.

We wonder, however, whether there are many clubs that can equal, let alone beat, the locomotive production to be found in the Brighton, Hove and District Society of Model Engineers. In a recent conversation with Mr. G. H. Davis, of that society, he showed us a list of locomotives which his fellow-members have built or have under construction. There are no fewer than forty-three of them, including one for "OO" gauge and four for "O" gauge. The others range from 1¾-in. to 7½-in. gauge, the majority favouring 3½-in. gauge. Except for the "OO" gauge and three of the "O" gauge engines, which are electrically operated, these engines are all live-steamers; when they are all finished and ready to take their turns on the society's passenger-carrying track, they should make an imposing collection.

Most of them are of "L.B.S.C.'s" ever-popular designs, but there are one or two unusual types among them. For example, Mr. Perryman's 5-in. gauge L.B. & S.C.R. 4-6-4 tank, Mr. Munt's 5-in. gauge G. & S.W.R. 4-6-4 tank engine, Mr. Achard's 5-in. gauge G.W.R. 0-6-0 pannier-tank and Mr. Funnel's 5-in. gauge L.B. & S.C.R. 0-4-2 "Gladstone" class engine are examples that are not commonly found and, for this reason, should be particularly attractive, especially if they are really representative of their prototypes.

A $\frac{3}{4}$-in. Scale G.N.R. "Atlantic"

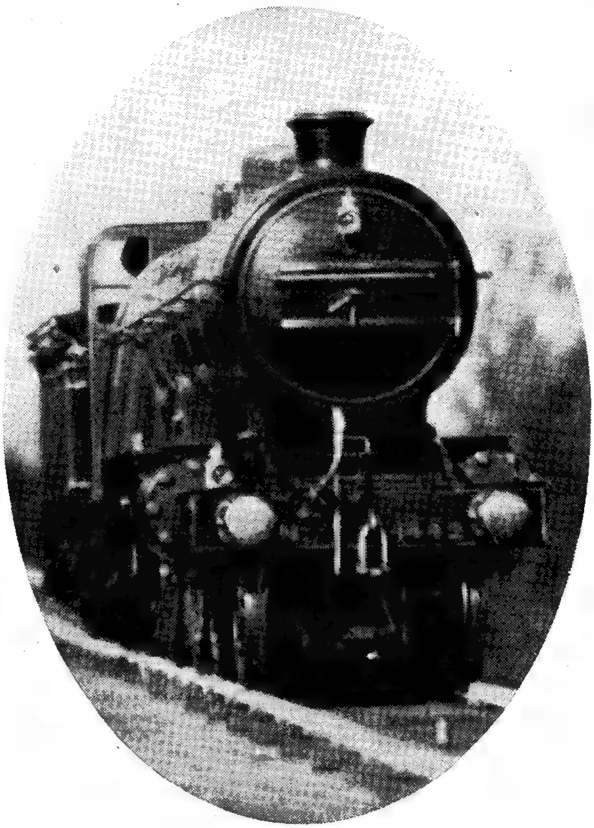
THE accompanying photographs show the $\frac{3}{4}$-in. scale, $3\frac{1}{2}$-in. gauge, Great Northern Railway 4-4-2 which I completed in September, 1949.

The engine is finished in the old G.N. livery and is embellished, [redacted] was its prototype, No. 1442, complete with coats of arms on the rear splashers.

The engine is built according to the "words and music" by our old friend and mentor, "L.B.S.C.", with slight variations in detail.

Construction follows conventional practice and the fittings include injector, mechanical lubricator and the usual odds and ends; the tender has [redacted] hand brake.

I started the job in October, 1945, and owing to circumstances, I had several parts made by advertisers in THE MODEL ENGINEER.



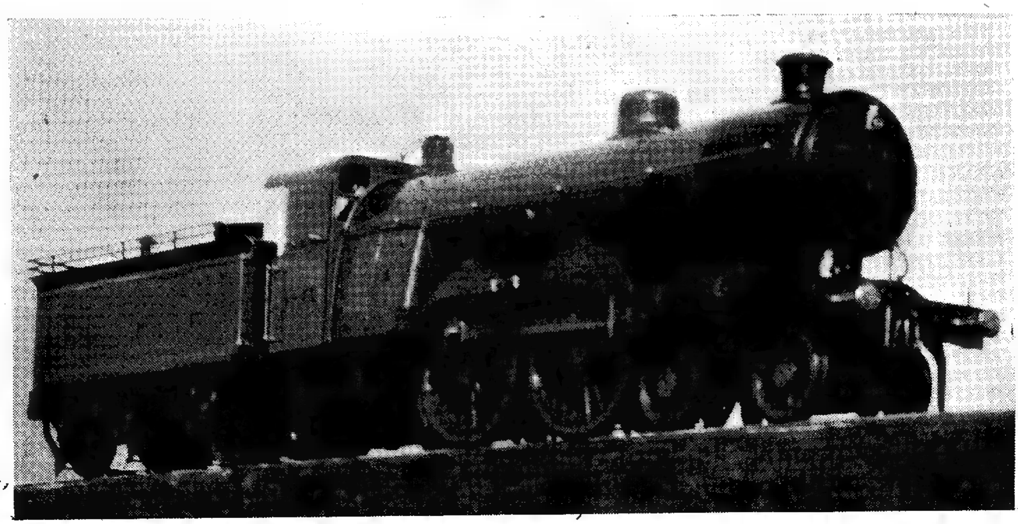
The engine performs very well in service, and the boiler, which is of the original design, makes all the steam required for normal requirements, it is, in fact, difficult to prevent her blowing off.

The fuel is usually [redacted] mixture of anthracite and ordinary coal; I find a thin fire makes plenty of steam.

The engine is very economical on water and oil; the lubricator has [redacted] plunger 3/32 in. diameter, and seems to deliver all the oil required.

This is my first locomotive; [redacted] least, the first steam, coal-fired, engine. I have built several electric "carcases."

I am now building a G.N. 4-4-2T [redacted] companion engine.



Novices' Corner

Mounting Work Between the Lathe Centres

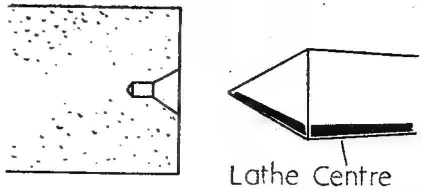


Fig. 1. Showing the correct form of drilled work centre

WORK is usually turned between the lathe centres to ensure accuracy and to enable all parts of a long shaft to be machined truly in line with one another; for example, when machining an engine crankshaft, the seating for the flywheel at one end of the shaft must be turned in true alignment and concentric with the bearing journals, as well as with the crank mounting at the other end. In the first place, the lathe centres must be in good condition and properly fitted in their tapered housings. The headstock coned centre is usually left unhardened so that, when necessary, it can be remachined to the correct angle of 60 deg. by setting over the top-slide, and then taking a light cut with a knife tool set at exactly centre height. The tailstock centre is, however, always hardened, as it has to act as a bearing for the outlying end of the rotating work; when this centre has become worn or scored, it will usually have to be reground to restore the bearing surface.

To allow the coned centres to seat properly, it is essential that their tapered housings should be cleared of chips and swarf before the centre is inserted; or, still better, perhaps, a piece of rag packing in the mandrel bore may be used to exclude chips, and a coned centre or other fitting should always be kept in place in the tailstock barrel for a like purpose.

If the mandrel centre runs out of truth, this will cause the work also to run eccentrically when, later, it is turned end-for-end and again mounted between the lathe centres. This error of centring can readily be determined by applying the test indicator, and the mandrel centre must first be trued if accurate machining is to be done.

Preparing the Work

Just as the lathe centres must be in good condition, so also must the work itself be carefully prepared if it is to continue to run truly throughout the subsequent machining operations. This

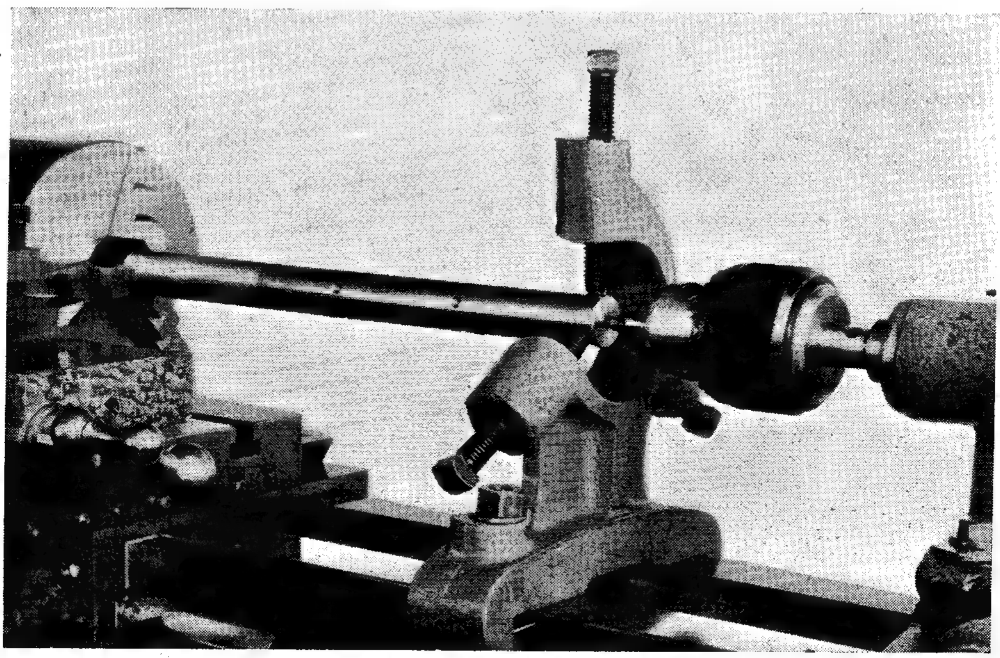


Fig. 2. Using the fixed steady when centre-drilling a shaft

[redacted] that not only must the drilled centres be of the correct form, but these work centres must also lie on the [redacted] long axis, and preferably, be truly centred in the ends of the shaft. The actual drilling is carried out with [redacted] centre drill of the well-known form, which machines [redacted] conical recess having [redacted] included angle of 60 deg. and, in addition, [redacted] shown in Fig. 1, the pilot portion of the drill forms [redacted] small oil reservoir that helps to maintain the lubrication of the bearing. The size of the centre recess is of some importance, for, if too large, it will mar the appearance of the finished work, and, if too small, it will not afford a bearing of sufficient area to resist wear during a heavy or prolonged machining operation. There are two ways in common use of drilling these centres : either the ends of the faced work are painted with marking fluid, and, after the centres have been marked-out with the jenny calipers, the drilling is done in the drilling machine, or, better still, the lathe can be made to centre the work, and a centre drill mounted in the tailstock drill chuck is employed to machine the centre recess.

Short shafts can be set to run truly in the four-jaw chuck with the aid of the test indicator and, after the end of the work has been faced, the centre is drilled from the tailstock ; the work is then reversed in the chuck and the other centre is drilled in the same way. Larger or more slender shafts will, however, not have sufficient rigidity for this purpose, and additional support must then be given to the overhanging end of the work. A method of mounting [redacted] long shaft in the lathe for centre drilling the two ends is illustrated in Fig. 2. One end of the shaft is gripped in the self-centring chuck, provided that this chuck holds truly ; if not, the four-jaw chuck must be used to centre the work. Next, [redacted] shown in the photograph, the fixed steady is applied close to the overhanging end of the shaft, and the pressure screws [redacted] tightened until they bear lightly and evenly [redacted] the work without deflecting it from the lathe axis. Should the shaft not be quite straight, its free end will tend to wobble, and no attempt should then be made to force it into line by tightening the pressure-screws. To overcome this difficulty, the work is partly withdrawn from the chuck so that it is gripped only by the tips of the jaws ; this will allow the shaft to line itself up in the steady without imposing [redacted] strain on the mandrel bearings or even bending the shaft. The end of the shaft can now be faced, and, as shown in the photograph, the centre drill is fed to the work by means of the tailstock. If the point of the centre drill cuts a small circle on the end of the work, this means that the steady has pushed the shaft out of line with the lathe axis, and the setting must, therefore, be corrected until the drill is able to cut correctly, otherwise the drill will refuse to cut and its pilot portion will be broken off if excessive feed pressure is applied. When a satisfactory centre has been drilled, the shaft is reversed in its mountings and the drilling operation is repeated.

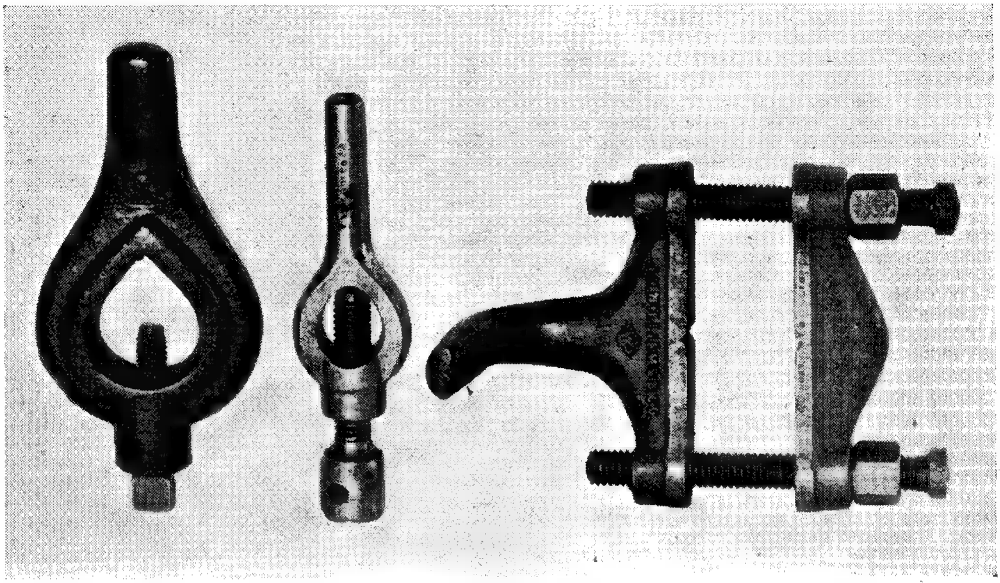


Fig. 3. Three forms of lathe carriers

Fig. 4. Method of locating the lathe carrier on the work

For carrying out the main turning operations [redacted] the work, the shaft, when mounted between the lathe centres, is driven by means of a carrier

which abuts against [redacted] dog or bolt attached to the driver plate, [redacted] catch plate [redacted] it is sometimes called, secured to the lathe mandrel nose. Three forms of lathe carriers are shown in Fig. 3; that on the left of the photograph is No. 3 of a

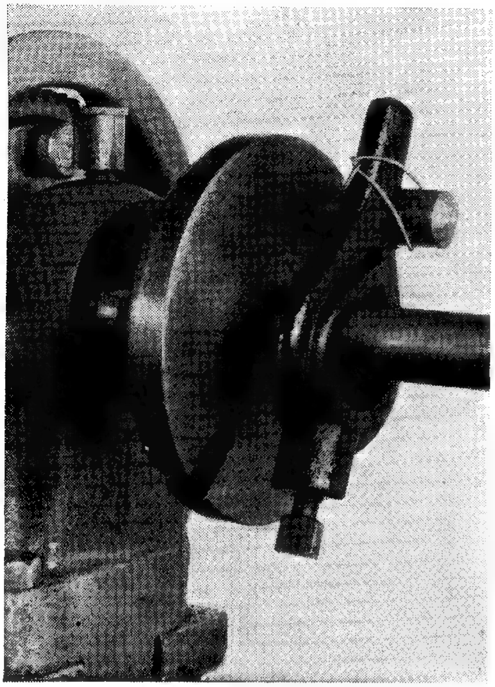


Fig. 5. Method of using a carrier for driving the work

set of malleable-iron carriers; the central carrier has [redacted] steel body and holds up to ½ in.; the special form of carrier on the right has [redacted] large holding capacity and is furnished with [redacted] projecting leg which engages directly in the slot of the driver plate and takes the place of a separate driving dog.

When cutting screw threads in the lathe, it is important that the carrier should not slip on the work, as this would cause the thread to be damaged and to be cut irregularly. The clamp-screw of the carrier is, therefore, given [redacted] secure hold by forming either a small flat or [redacted] drilled depression on the end of the shaft, as represented in Fig. 4. If the end of the shaft is left plain, any finished surface should be protected from damage by means of [redacted] brass or copper pad-piece. The driving arrangement, consisting of carrier, dog, and driver plate is illustrated in Fig. 5, and it will be seen that, in addition, [redacted] piece of wire has been used to hold the leg of the carrier against the driving dog; this is done to keep these parts from knocking together when work with an irregular surface is being machined and the cutting pressure does not remain constant.

When turning shafts of small diameter, it may be found that the tip of the turning tool comes into contact with the tailstock centre before the finished diameter has been reached; this can be obviated by using what is termed [redacted] half-centre.

This fitting is not, however, cut away [redacted] far as the centre-line, but, as shown in Fig. 6, it is

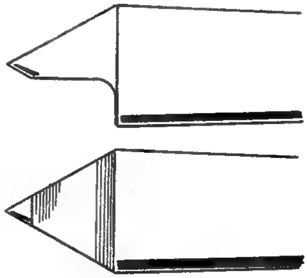


Fig. 6. Form of half-centre for the lathe tailstock

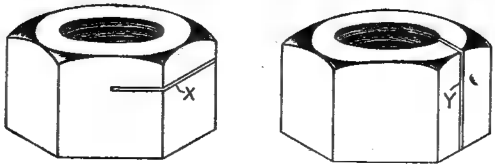
formed with a flat which leaves a small conical tip for supporting the work.

Finally, when turning work between centres, keep the tip of the back centre clean and well lubricated, and, at the end of each cut on [redacted] long piece of material, readjust the setting of the tail-stock to allow for expansion caused by heating of the work.

Fitting Loose Nuts

It is not always possible to replace [redacted] loose-fitting nut on [redacted] particular stud in [redacted] machine part. The defect may not be in the standard threaded nut, but on the thread of the stud which may be difficult to withdraw and replace. In this case something must be done with the nut, and the following ideas will be found useful.

In cases where the nut is required to be very tight and under [redacted] good stress, try [redacted] fine saw-cut made parallel with the end faces, [redacted] shown at *X*, view *A*, in the accompanying illustration. Pinch the cut up slightly in the vice, and the nut will be found to work a good fit. For general work where the nut is under normal stress, the saw-cut is made parallel with the sides, [redacted] indicated at *Y*, in view *B*. Like the previous case, the nut in view *B* is pinched up slightly in the vice, and loose-fitting nuts treated in this manner will stand up to frequent adjustments.



Loose-fitting small brass nuts may be made a good fit in the following manner. First, lightly solder the thread, and then retap with the taper tap until a good fit on the stud thread is obtained.—W. J. SAUNDERS.

IN THE WORKSHOP

by "Duplex"

No. 72.—*A Small Power-driven Hacksaw Machine

FOLLOWING the V-belt drive, [redacted] further reduction of the drive ratio is obtained by gearing the 25-tooth countershaft pinion with a 96-tooth gear wheel fixed to the end of the crankshaft.

The general arrangement of the drive is shown in [redacted] previous photograph, Fig. 5, and the constructional details are now given in the accompanying working drawings.

A 25-tooth pinion was chosen, [redacted] this was the smallest size of wheel that could conveniently be fitted. To obtain a gear reduction of approximately 4 to 1, a Myford standard lathe change wheel having 96 teeth was employed; as the tooth numbers have no common factor except unity, the wear on the teeth will be more evenly distributed than would be the case were, say, 25-tooth and 100-tooth wheels fitted.

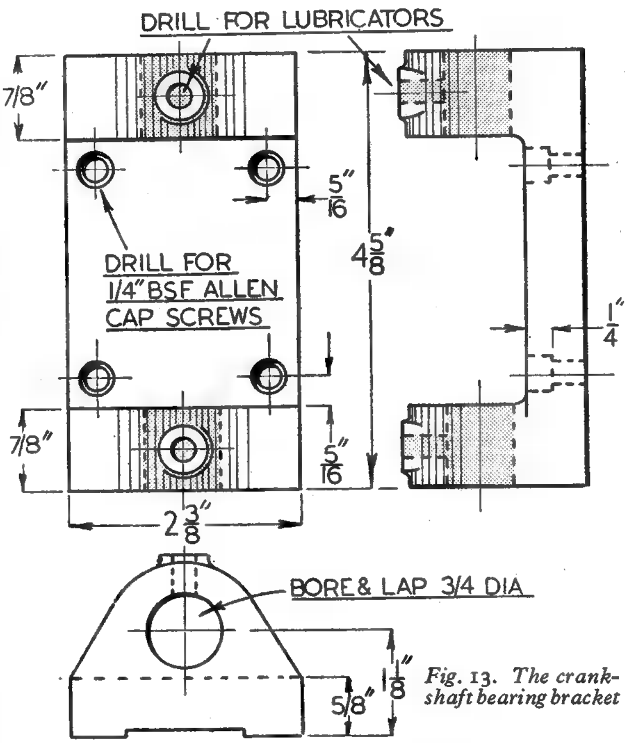


Fig. 13. The crankshaft bearing bracket

The Crankshaft Bearing Bracket—Fig. 13

The casting for this part is similar to that used to mount the countershaft.

As in the previous example, the two side faces and the end faces are machined truly at right-angles to one another, for the right-hand side face is again used as a datum surface for locating the casting correctly on the base plate. In addition, the inner faces of the bearing lugs are either filed true or surfaced in the shaping machine; this becomes necessary, [redacted] these surfaces form abutment faces for the two end-location collars fitted to the crankshaft; but, as [redacted] alternative, it may be found possible to back-face these surfaces when the bearings are being bored.

After the casting has been marked-out to determine the bearing centres, guide circles should be scribed to indicate the full diameter of the bores. The vertical centre-lines should be conspicuously marked, [redacted] they will be required later when setting the gear shafts to the correct distance apart.

As a preliminary operation, the bearing lugs are drilled to form [redacted] passage for the boring bar used to finish the bearings to size, or this passage can be machined by mounting the casting on an angle plate attached to the lathe faceplate and boring each lug in turn. For the final boring operation to machine the bearing bores to their finished size, it was found that the casting could be mounted conveniently by gripping it in a machine vice attached to the lathe cross-slide. The fixed jaw of the vice is aligned parallel with the lathe axis with the aid of the test indicator, and the datum surface on the side of the casting is placed against this jaw. The test indicator, when fitted with its internal contact attachment, is then used to centre the preliminary bearing bore formed in the casting.

Packing strips are employed, where necessary, to adjust the vertical height, and the cross-slide is locked after it has been set to locate the bore correctly in the horizontal plane.

A boring bar, of sufficient length to enable the inset cutter to machine both bearings, is next mounted between the lathe centres.

As the diameter of this boring bar will be small relative to its length, it will lack rigidity; only

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*Continued from page 382, "M.E.," September 7, 1950.

light cuts should, therefore, be taken with a fine self-acting feed to avoid springing the tool. In fact, when the full diameter has been nearly reached, the tool should be put through the bearings without altering the depth of cut. If a sharp tool is used for the final cut, the finish of the bores may be found satisfactory and not in need of reaming, for it may be taken into consideration that the crankshaft runs at only some 90 r.p.m. and the large bearing surfaces provided are only lightly loaded. As a matter of interest, the bearings were actually bored with a $\frac{7}{16}$ in. diameter boring bar furnished with a single inset cutter, and the tool marks were removed from the bearing surfaces by taking a series of very fine cuts with an adjustable hand reamer.

To complete the machining of the casting, the holes are drilled for the attachment screws and for the lubricators.

The next step is to clamp the casting in position on the base plate, as was done when securing the countershaft casting, and then to drill and tap the holes for the Allen fixing screws.

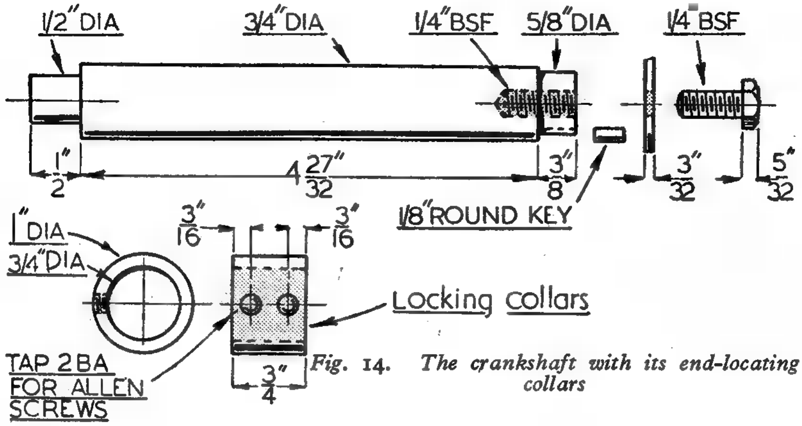


Fig. 14. The crankshaft with its end-locating collars

The front face of the casting is set $\frac{7}{16}$ in. back from the front edge of the baseplate, and a try-square is used against the datum face on the side of the casting to align it exactly parallel with the countershaft casting. The gear wheels are set at the correct centre distance apart by referring to the centre lines scribed on the two castings. The gear centres are, of course, measured from the pitch circles of the two 20 diametral pitch wheels. The radius of the pitch circle of the 25-

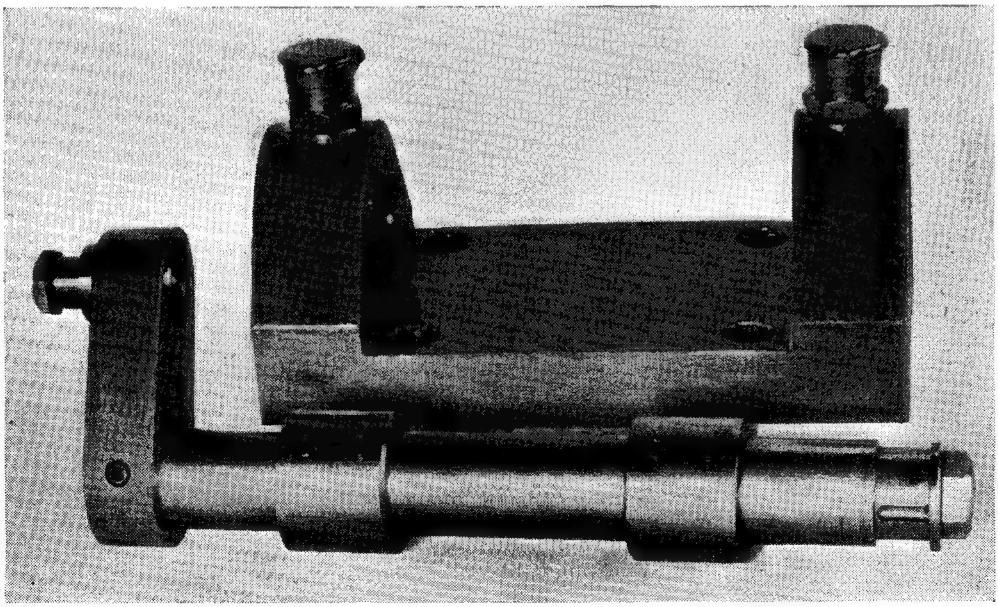


Fig. 15. The complete crankshaft assembly with its bearing bracket

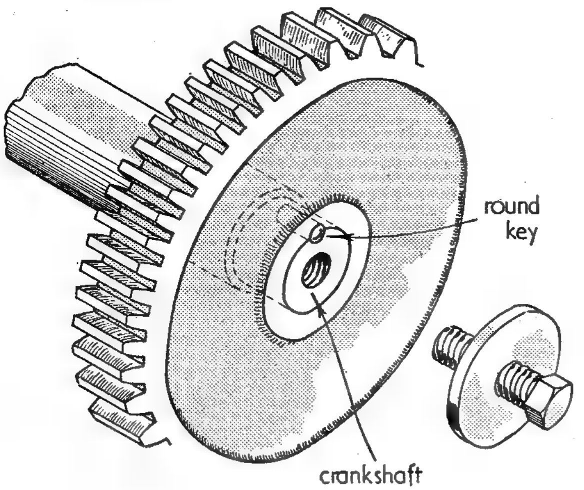


Fig. 16. Method of securing the gear wheel to the crankshaft

tooth pinion equals $\frac{25}{2 \times 20}$, and for the 96-tooth wheel $\frac{96}{2 \times 20}$.

Adding these two values gives 3 1/40 in. for the sum of the two radii, that is to say the correct working distance between the wheel centres.

If the centre-lines of the two castings are, therefore, set 3 1/32 in. apart, this will serve quite well, as the eccentric mounting of the pinion shaft allows for a range of adjustment of $\frac{1}{8}$ in.

The Crankshaft

The dimensions of this part are given in Fig. 14, and the complete crankshaft assembly is shown in Fig. 15.

As it is important that the gear wheel at one end and the crank at the other should run truly, the crankshaft is best turned between centres to ensure that both the wheel seat and the crank mounting are in proper alignment with the bearing surfaces.

If a standard change wheel is used for the large gear wheel, it may be found that the bore is slightly larger than the nominal size to enable the wheel to turn freely on its quadrant stud ; this must be taken into account when machining the crankshaft so that the wheel is made a light press fit on its seating.

If a sharp tool is used, together with a fine feed, the bearing journals may be finished by machining them to a running fit in the bearing casting, but, preferably, the journals should be turned slightly oversize, and finished by a lapping operation.

Should lapping be used for this purpose, much time and labour will be saved if the centre portion of the shaft is reduced in diameter by a few thousandths of an inch to form a waist, but parallel seatings must be left for the two collars that provide for the end-location of the shaft. These collars should be bored to a close sliding fit on the shaft and, as shown in the drawing, they are secured in place with Allen set-screws.

A central, hexagon-headed screw is fitted to press the gear wheel against the shoulder formed on the shaft, and the drive is taken by a cylindrical key lying half in the shaft and half in the wheel, as shown in Fig. 16. To form the seating for the key, a punch mark is made at the line of junction of the two parts, to form a guide centre for a small centre drill ; the drilled recess is then machined to the full depth with a drill that gives a push fit for the round, silver steel key. This method of mounting the gear wheel provides a reliable form of light drive and, more-

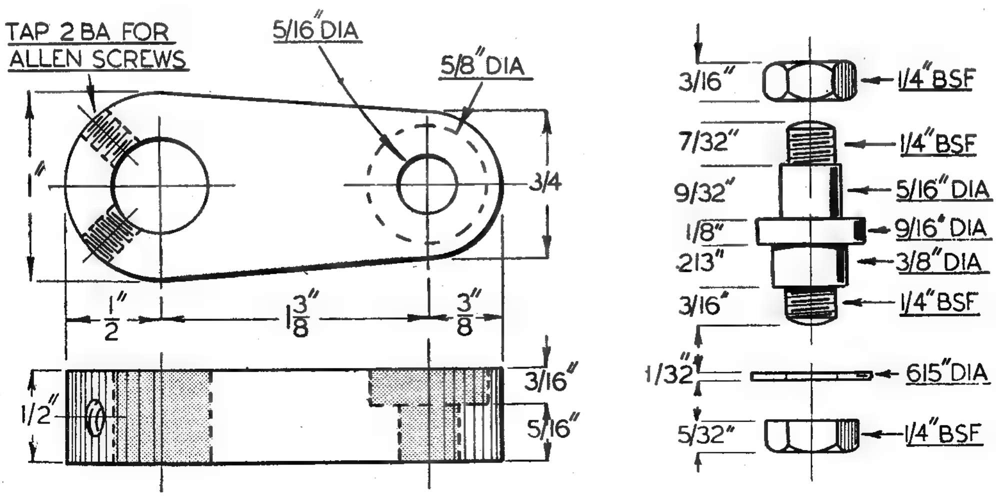


Fig. 17. The crank web and its crankpin

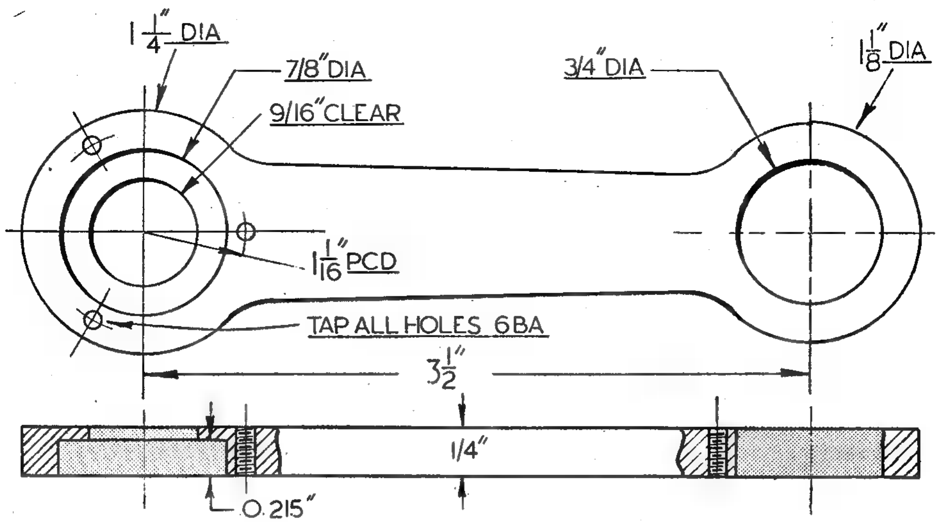


Fig. 18. The connecting-rod

over, the parts can at any time be easily dismantled.

The Crank

The crank is made from a short length of mild-steel machined and filed to the dimensions given in Fig. 17.

It is advisable to machine the bore of the crank in the lathe to a firm press fit on the end of the crankshaft. A single Allen set-screw should be sufficient to lock the crank to its shaft, but, if there is any doubt, it is better to fit two set-screws at right-angles to one another, as shown in the drawing.

In order to maintain the crank in true alignment it is provided with [redacted] seating ½ in. in length, and it also abuts against the shoulder formed on the crankshaft. The overhang of the crank is reduced by fitting the nut, securing the crankpin, into [redacted] recess formed in the crank web, as represented in the working drawing, and as is shown in the photograph Fig. 15.

The crankpin itself is also made a firm press fit in the crank web, and the large diameter shoulder affords an ample abutment face for maintaining the pin in accurate alignment.

When turning the crank pin, the overhanging portion must be machined to afford a light press fit for the inner race of the ball-bearing fitted to the big-end of the connecting-rod.

The Connecting-Rod

To make the machine compact, the connecting-rod has been kept short, but [redacted] the length of the rod between centres is 3½ in. and the stroke is 2¾ in., [redacted] ratio rather greater than 1¼ to [redacted] has been maintained. Moreover, by fitting [redacted] ball-bearing to both the big- and the small-end, the thickness of the rod, and the length of its bearings have been reduced to ¼ in. As will be seen in the working drawings, Fig. 18, the outer race of the ball-bearing fitted to the big-end is clamped with [redacted] pressure plate, Fig. 19, against [redacted] shoulder formed in the eye of the rod. The outer race of the small-end bearing, however, is made [redacted] light press fit in its housing. These small ball-bearings are largely used in aircraft control mechanisms, and the balls are then given some radial clearance to allow the outer race to be pressed into a housing without causing locking or rough running of the bearing.

Nevertheless, the freedom of [redacted] bearing of this type should be tested after fitting, and if necessary

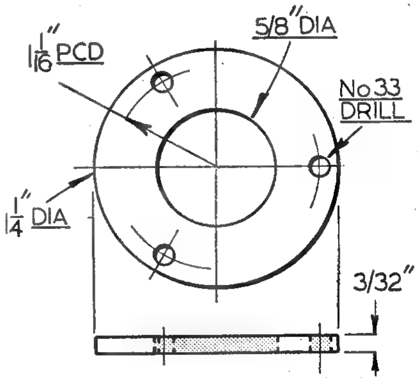


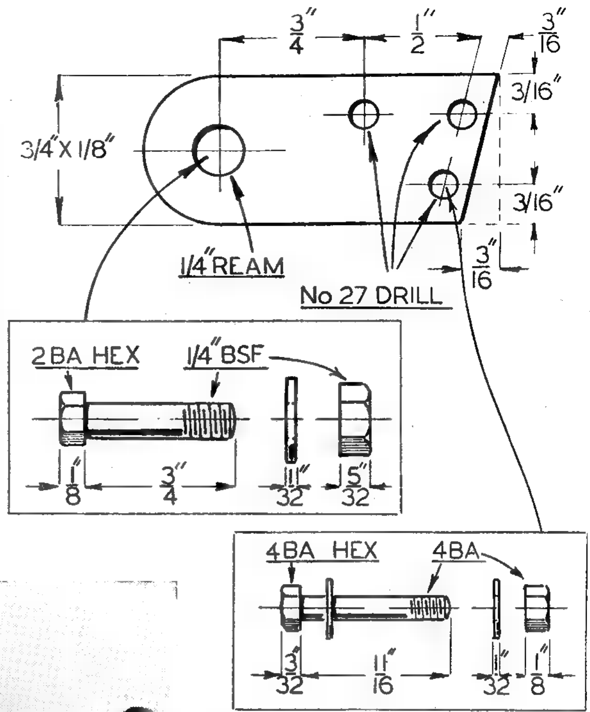
Fig. 19. Pressure plate for securing the big-end ball-race

the bore of the housing must be eased to give free running.

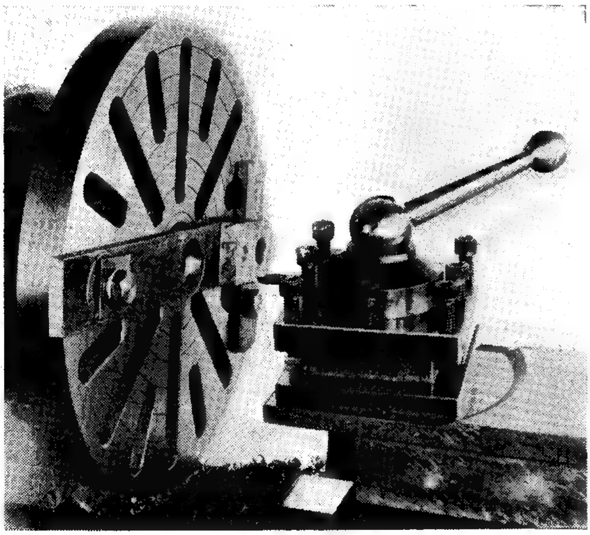
After the rod has been marked-out in accordance with the drawing, the profile lines should be dotted with [redacted] centre punch to ensure that they are not obliterated by the subsequent machining operations. The rod centres [redacted] drilled with [redacted] centre drill, and these centres [redacted] used for setting up the rod on the lathe face-

plate for machining the bearing housings. A convenient way of mounting the rod is illustrated in Fig. 20, and, when in position, either bearing centre can be set to run truly with the aid of a centre finder. As shown in Figs. 21 and 22, the small-end of the rod is connected to the saw frame by means of a bracket, which also carries the small-end bolt or gudgeon-pin. This pin is made a close sliding fit in the inner ball-race, and packing washers are inserted between this race and the side members of the bracket, so that when the gudgeon-bolt is tightened, the race is firmly clamped and kept from turning. These packing washers also serve to keep the bracket members, just clear of the connecting-rod itself when all the bolts are tightened.

To ensure that all the bolt holes in the bracket are drilled correctly in line, it is advisable to mark out one of the bracket members and then to clamp it with toolmakers' clamps to a similar piece of material,

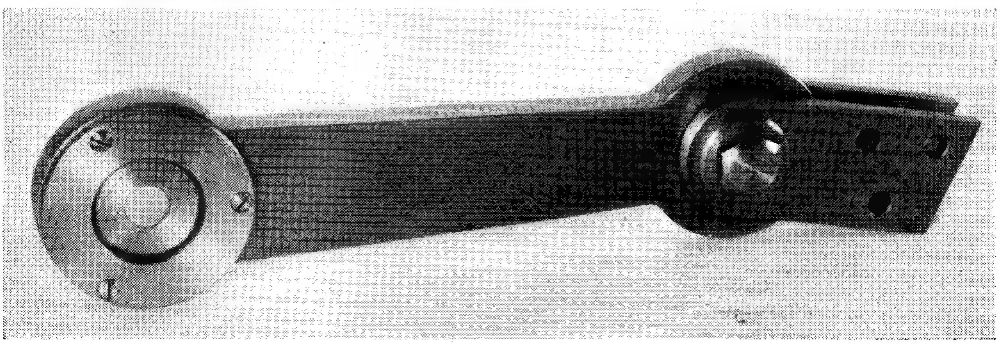


Above—Fig. 21. The small-end bearing bracket with its bolt fittings



Left—Fig. 20. Boring the connecting-rod mounted on the lathe faceplate

Below—Fig. 22. The connecting-rod assembly with its small-end bracket



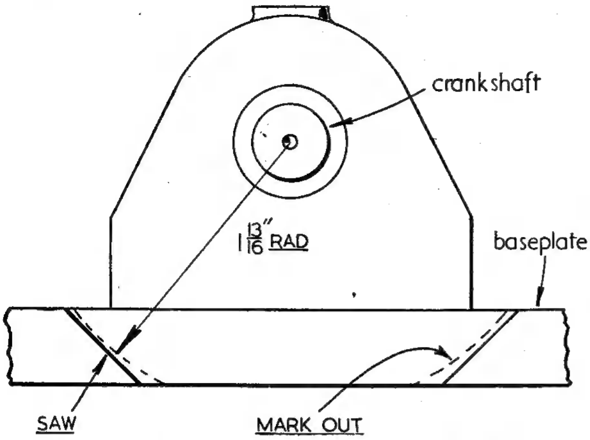


Fig. 23. Method of marking-out the crank pit

so that all holes are drilled at one setting.

As the centre-line of the crankshaft is only $1\frac{1}{8}$ in. above the upper surface of the baseplate, a gap, as shown in Fig. 23, must be cut in the baseplate to allow the crank to pass.

The contour of this gap can be marked out by placing one leg of the dividers in the centre hole in the end of the crankshaft, and then scribing segments of a circle of the correct radius on the front edge of the baseplate. When the limits of the gap have been marked-out, a hacksaw is used to cut away the surplus metal to a depth of $\frac{3}{8}$ in., and the work is then finished by filing. After removing the connecting-rod, it will now be possible to run the complete driving mechanism. A little thin grease should be applied to the gear teeth, and the meshing of the gear wheels is adjusted until quiet but free running is obtained. It may be found that rather close meshing, to eliminate nearly all the lash or play, is required for quiet working.

(*To be continued*)

For the Bookshelf

Scottish Railways, by O. S. Nock. (Edinburgh. Thomas Nelson and Sons Ltd.) 214 pages, size 6 in. by 9 in. 14 full-page plates in colour; 16 half-tone plates. Price 18s. net.

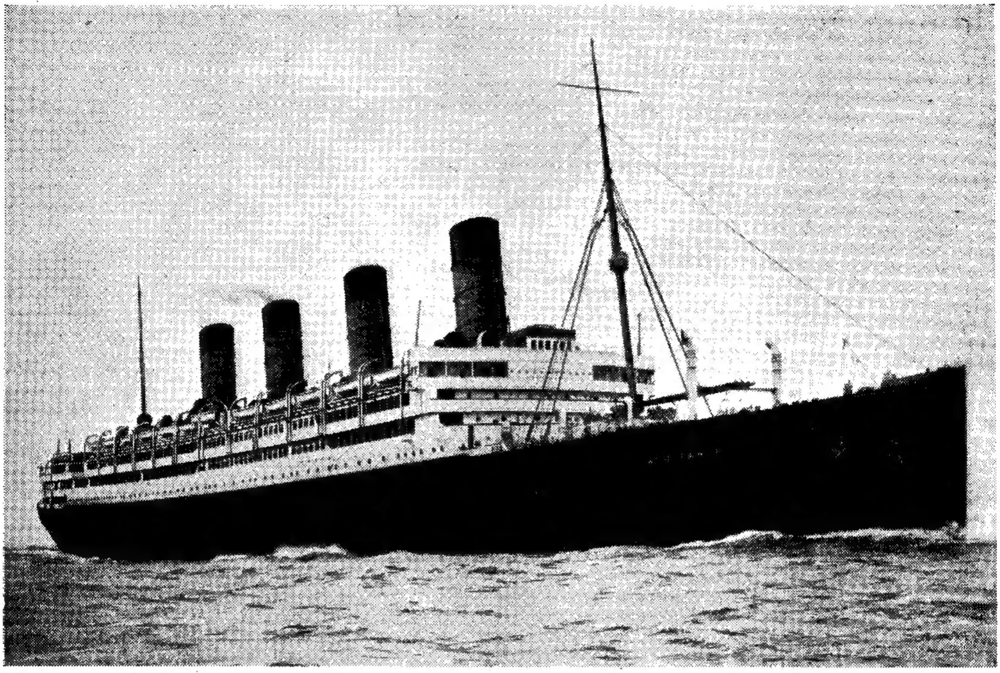
The railways of Scotland had a history and romance which were theirs and theirs alone; nowhere else in the British Isles were the conditions to be faced quite the same, either during construction or, later, when the railways had been built and opened for traffic. Mr. Nock surveys the early history of each of the five Scottish main-line railways, and then entertains his readers to accounts of first-hand observations of the working of these lines in modern times. It is natural that a great deal of prominence is given to the locomotive department, because Mr. Nock has been privileged to travel many hundreds of miles on the footplates of locomotives operating in Scotland; but we are given glimpses, as it were, of the work of other departments which have to do with the running of the trains on land and the steamers on the rivers and lochs. The topography and climate also come in for their share of attention, and there are some judicious references, here and there, to unique scenic beauties without which any account of Scottish railway journeys would be incomplete.

The illustrations have been very well chosen; most of the half-tones are reproduced from photographs, many of which we do not recall having seen before, while among the tailpieces there are some excellent, small-scale reproductions of beautifully-executed line drawings of locomotives. The main feature in the illustrations, however, is the series of fourteen full-page coloured plates reproduced, with one exception, from paintings by V. Welch and Mr. Nock himself. The majority of these plates are of first-class quality, as regards drawing, colouring and reproduction; but there are three which we feel are decidedly open to question. The splendid study of a North British Railway Atlantic engine is, in our opinion, not green enough; but two plates depicting Highland Railway locomotives, presumably at the same period, are so unlike as to compel us to ask: Which is right? Mr. Nock's study of a double-headed Highland train shows the colour as a pale greenish yellow, but Mr. Welch's splendid painting of the 4-6-0 locomotive, *Clan MacKinnon*, depicts a rich, bluish green; we venture to suggest that the latter is far from correct. The Caledonian blue, on the other hand, is very successfully rendered; and here again, it is possible to compare two plates, one from a painting by Mr. Welch, and the other a reproduction of a direct colour-photograph taken by Mr. Kenneth Leech. There is little if anything, to choose between them, so far as the colours are concerned.

In all other respects, this is a really worthy book, one which can be taken up at any time, opened at any page, read with enjoyment and then put down with reluctance. The vivid descriptions of footplate trips and the ever-present impression of keen, but restrained enthusiasm for his subject are such as to ensure that Mr. Nock's writings can never fail to give unbridled pleasure to all who love railways.

GOOD-BYE OLD LADY

by Bernard J. Farmer



ONCE a ship's fireman, I think back thirty-five years to when R.M.S. *Aquitania*, new and lovely, was making one of her early voyages from Liverpool to New York. She was a coal-burner then and carried nearly four hundred firemen and trimmers to feed her 168 furnaces. I was one of the lucky ones—a member of the "black gang."

Yet I suppose not many people would call me lucky. I could swagger in port—an *Aquitania* fireman; but at sea I had to do my share of the toil in heat, blinding coal dust, using the shovel and the "devil"—a 60-pound iron slice-bar with a flat end to plunge into white-hot coals, and make them burn with the maximum amount of draught, much as a householder pokes his fire. A fireman worked a four-hour watch and he kept going nearly every minute of it. The only refreshment provided was a little oatmeal and water. To drink unlimited water would cause stomach-cramps. Each man would do two watches to the twenty-four hours, and during this time he reckoned to shovel about five tons of coal. He also had one fire to clean per watch; and this was a heavy job, turning the fire from one side of the grate to the other, pulling out the clinkers, dousing them with water, and then pitching up the cleaned fire in the usual way. A bad fireman would let the steam down; and, in the engineers' eyes, that was the worst crime he could commit.

I remember a visitor to the stokeholds. A junior engineer was taking him round. In the engine-room he had no doubt filled the visitor up with facts and figures. Quadruple screws. Latest pattern turbines, 63,000 shaft horsepower. But in the stokehold he left the scene to speak for itself. As a furnace-door opened, the visitor recoiled from the fierce heat. He watched the fire being pitched up. Shovelfuls of coal hurled right through the open mouth to the back, left and right. He turned and saw trimmers bringing barrow-loads of coal from the bunkers to the stokehold floor. He saw firemen, sweat-rags round their necks dripping, their arms gleaming with sweat, and dirt like black kid gloves. He breathed in the coal-dust and his lips strove to shout some comment above the hideous clangour of fire-doors and shovels.

A fireman, passing him, stooped and swiftly, with a piece of chalk, drew a circle round his feet.

"What does that mean?" asked the visitor.

"Well," said the engineer, "it's an old stokehold custom. It means that they've ringed you and you must pay forfeit—beer money."

The visitor paid with several pound-notes. I think he was glad to get away.

Yet the *Aquitania* was always a comfortable ship. She wasn't a racer like the *Mauretania*. Her service speed was only about 23 knots. She wasn't expected to break the Atlantic record

and she didn't try. The *Mauretania* firemen, mostly Liverpool Irish, were top-swaggerers in port, the men who drove the ship to hold the coveted Blue Riband but they certainly paid for it! In fact the "Maurie" when going full ahead was driven prize-fighter fashion, a gong striking seven-minute rounds during which the army of stokers worked in a frenzy of activity—about the toughest job on earth.

By contrast, I suppose, we had a gentleman's life because we had no cruel record to lower. The *Aquitania* was always a remarkably steady ship; and a little imagination will show what a fireman's life could be like in a very rough sea. He could be thrown from one end of the stokehold to the other. Boilers are designed with an eye to efficiency, not cushion-effects; and in North Atlantic winter weather a new fireman might remember a voyage to the end of his days.

It follows that members of the black gang were pretty tough customers. "Trouble in the firemen's fo'c'sle" was by no means uncommon in many ships. Not, however, in the *Aquitania* where men were chosen for their good character as well as their skill. A seaman, of course, always has his discharge book in which his record may be traced; and V.G.—very good, was wanted. In 1920 the *Aquitania* was converted to oil-burning, and her army of firemen became unnecessary. After the conversion I had an opportunity of going down to her stokeholds, and I wouldn't have known her. So clean. With boiler attendants in white overalls—white, if you please—turning an oil-jet up or down; a nice languid occupation! And Sid and Dick and Micky and Mike—they were scattered to other craft which still burnt coal, hand-fired, or, what is a plum in a stoker's life, large land installations such as electric power-stations.

Now the *Aquitania* is being broken up on the Clyde, her birthplace. Her old friends can only remember her—the "ship beautiful." But, best of all, she always behaved as a lady should to those who served in her.

PRACTICAL LETTERS

Rust Preventatives

DEAR SIR,—Mr. Searles and perhaps also Mr. Thomas, is not alone in his difficulties with rusting of tools. He may be interested to know that in some theatres, particularly the tropical ones, during the last war, nearly as much equipment was lost by bad packing during transit and storage as was actually used during the fighting.

I was given the task of organising and equipping one of the laboratories set up specially for the purpose of testing methods of packing to ensure safe transit and storage to all theatres.

Put briefly the problem resolves itself into two parts (*a*) mechanical damage which can be overcome by suitably strong cases with shock absorbing mounts where necessary and (*b*) chemical damage which is largely caused by water as a vapour and not the liquid. This type of damage, of which the rusting of steel is but one example, is overcome by keeping the article to be protected in a case or cover which is impervious to water vapour. The important point here is that some wrappings which are normally described as waterproof are anything but impervious to water vapour. A simple, if extreme, example is the material of which tents are made. Although the tent sheds water very effectively it is obviously porous.

The mechanism of rusting is simply that when a current of warm wet air meets the colder steel, water condenses out of the air on to the steel and starts the rusting process. Just to make matters worse the actual phenomena of condensation and rusting cause a drop in the local air pressure and more warm wet air is brought in with more rusting to follow and so the process goes on.

The cure obviously is to pack the items dry and keep them dry, but how to do it depends on the article and the period of storage required. Let us deal with the methods available first. These are:—

(1) *Dipping (or painting) treatments.* Various solutions are available, made up to Government specifications. The simplest (and incidentally available cheaply on the surplus market) is lanolin solution. This is excellent for tools and materials which may not be used frequently and can be inspected say every three months. An elaboration for longer periods would be to dip two or three times, wrap tightly in greaseproof paper and dip again two or three times, thereby, adding mechanical protection to the film of lanolin.

(2) *Enveloping methods* come next and divide into two (*a*) flexible and (*b*) rigid. The flexible envelope is a thick film of a suitable plastic material described technically as vapour phase inhibiting (V.P.I. for short). The article is placed in the envelope and the envelope sealed either by heat or a special solvent. This is essentially a once only process and is suited to small articles like dry batteries and dry foodstuffs.

The rigid envelope is best known by our old friends the soldered tight tea chest and the "tin trucks" with a sealing gland of rubber round the lid. To get good results with this method for long periods it is advisable to put bags of silica gel, which absorbs water vapour very thoroughly, in with the articles.

I would recommend this method for a box of tools in use in a bad situation because (1) the silica gel can be reactivated by merely heating in an oven to say 120 deg. C. (250 deg. F.). (2) The gel can be changed as often as necessary and a spare supply kept on hand by storing in a Kilner jar, or other really airtight container.

In conclusion, I would say if Mr. Searles has anything he especially values he should have it packed or the packing supplied by one of the firms specialising in "tropical" packing. I can give him names and addresses if he wants them or as he is so far away perhaps I could help him to have materials sent out.

Yours faithfully,

Farnham. "PHYSICIST."

Refrigeration Gases

DEAR SIR,—For the information of readers building a refrigerator I have found that the American gas Freon 12, which is the same as the British Arcton 6 ($C\,CL_2F_2$), is the best, the most expensive for domestic refrigerators; also, the *only* gas to use with aluminium compressors. It has definitely no chemical action. The aluminium compressor which I intend using, off ex-aircraft refrigerator, I have now stripped, and find the internal surfaces are as clean and bright as when first manufactured, and also in perfect mechanical condition. Mr. L. C. Sherell stated in his article on domestic refrigerators that possibly Freon 2 was best but unobtainable. I find from I.C.I. Ltd. that its cost is 6s. ½d. per lb., minimum weight sold 22 lb. £6 deposit on cylinder (returnable). They state that they *do not* supply *any* refrigerator gases in smaller quantities. In view of this, can Mr. L. C. Sherell inform me as to where he obtained his 3 lb. methyl chloride; also, where I might obtain 3 or 5 lb. of Arcton 6. Obviously, it is prohibitive to purchase 22 lb. of gas when only a couple of pounds are needed and then have to waste about £5 worth of gas to be able to obtain the £6 refund on the cylinder if dealing with I.C.I. Ltd. I may add that B.C.M. Techniprints offer a steel bottle *empty* at £3 4s. for filling with 3 lb. methyl chloride.

Hoping my information will be of some interest and use.

Yours faithfully,
Stroud. D. BROTHER.

CLUB ANNOUNCEMENTS

Sutton Coldfield and North Birmingham Model Engineering Society

Our new season started with a swing on Tuesday, August 29th, when a member, Squadron Leader F. A. Chambers, gave a lecture on "Compressed Air, Its Uses and Applications." We all learned quite a bit about this subject, and its dangers, too!

A recent trip was paid to the Whitacre waterworks to inspect the Watt compound beam engines now being dismantled there. We are pleased to record that a set of drawings of these fine old engines are being acquired for the society's library. Future trips are Crewe locomotive works, Sunday, September 24th, and Myford lathe works, Saturday, November 18th.

We are all getting ready for our second exhibition which will be opened by the Lord Mayor of Birmingham at 3 p.m., on Thursday, October 12th. By the look of the entries coming in, it seems we shall surpass last year's successful show. Programme for September and October as under:—

Tuesday, September 26th. Open night.

Tuesday, October 10th. Exhibition discussion.

Thursday, Friday and Saturday, October 12th, 13th and 14th. Exhibition at the Church House, Erdington.

Hon. Secretary: C. F. PALMER, 77, Hartley Road, Kingstanding, Birmingham, 23.

Southport Model and Engineering Club

The above club is holding its third annual exhibition in the Cambridge and Victoria Halls, Lord Street, Southport, from October 28th until November 4th inclusive, excepting Sunday, October 29th. The exhibition will be officially opened at 2 p.m. on October 28th by His Worship The Mayor of Southport. After this the exhibition will be open daily from 11 a.m. until 10 p.m.

Entry forms can be obtained from the Hon. Secretary, T. NELSON, 41, Hawkshead Street, Southport, Lancs.

Glasgow Society of Model Engineers

The new secretary of the above society now is ALAN RODGER. His address is 93, Ormonde Avenue, Glasgow, S.4. The retiring secretary thanks all who supported his work over the last twelve years.

Harrow and Wembley Society of Model Engineers

The fixture list of the above society up to the end of December, 1950, is as follows:—

Wednesday, September 27th. Mr. G. H. C. Jones, Foreman of Works, South Kensington Science Museum. Talk on "Models and Modelmaking."

Wednesday, October 4th. Committee meeting.

Wednesday, October 11th. Mr. A. Peers, Editor of "Mechanics." Talk on "Model Engineering."

Wednesday, October 25th. Mr. W. J. Fryer, Footplate Inspector, L.M.R., will talk on his railway experiences.

Saturday, October 28th. Exhibition at Heathfield School (members' exhibits only).

Wednesday, November 1st. Committee meeting.

Wednesday, November 8th. Lantern lecture: "The Story of the Underground."

Wednesday, November 22nd. Jumble sale.

Wednesday, December 6th. Committee meeting.

Wednesday, December 13th. Mr. H. H. Anderson, M.I.Fire.E. Talk with films, "The Fire Service, Past and Present."

Wednesday, December 27th. "Get-together" night.

All of the above meetings will be held at Heathfield School, College Road, Harrow, commencing at 7.30 p.m.

Hon. Secretary: J. H. SUMMERS.

Harrogate Model Racing Car Club

The above club held an open meeting recently. The attendance was spoiled by rain but a number of people turned up to see some very good racing. Clubs represented were Sunderland, Derby, Bolton, Bradford, Altrincham, Guiseley, and Harrogate, 32 cars competing in the three classes. The results were:—

¼-mile F/S, 2.5 c.c.: 1st, Master J. M. Sutcliff, Bradford (Oliver), 47.87 m.p.h.; 2nd, Mr. Jackson, Derby (Oliver), 47.37 m.p.h.

¼-mile, F/S, 5 c.c., British: 1st, Mr. J. Green, Sunderland (Eta), 85.71 m.p.h.; 2nd, Mr. E. Armstrong, Sunderland (Eta), 78.24 m.p.h.

¼-mile, F/S, 5 c.c., Open: 1st, Mrs. Moore, Derby (Dooling), 92.75 m.p.h.; 2nd, Mr. Cook, Sunderland (Special), 73.77 m.p.h.

¼-mile, F/S, 10 c.c., British: 1st, Mr. J. Burns, Harrogate (Rowell), 81.83 m.p.h.; 2nd, Mr. Jepson, Guiseley (Rowell), 75 m.p.h.

¼-mile, F/S, 10 c.c., Open: Mrs. I. Moore, Derby (Dooling), 109.8 m.p.h.; Mr. Cook, Sunderland (Dooling), 109.8 m.p.h. Mr. Cook won on the toss of coin.

Nomination: Mr. Jepson, 75 m.p.h., no error.

Hon. Secretary: E. SELLERS, 23, West Park, Harrogate.

Buxton Model Engineering Society

The above society will be holding an exhibition on Saturday, October 28th, at the Hardwick Square Schools, Buxton. For the first time we shall be having a competition section, but all models, whether for competition or on loan, will be welcomed. Entry forms may be obtained from the secretary. We look forward to seeing again, this year, all our old friends from neighbouring clubs, and also the many "lone hands" from this district.

Hon. Secretary: L. M. HOBDEY, Westward Ho!, Lightwood Road, Buxton. Tel. 686.

The Tyneside Society of Model and Experimental Engineers

We are holding our annual exhibition from October 16th-28th inclusive, at the Chronicle Hall, Pudding Chare Newcastle-upon-Tyne.—In addition to a large display of models of all kinds, including cars, boats and locomotives, from 5-in. to "OOO" gauge, there will be a live steam passenger-hauling track; also demonstrations of models working under radio control and a cinema show featuring models in operation, and a film showing the various stages in the construction of the 700 ft. continuous locomotive track which this society is constructing in Exhibition Park.

Hon. Secretary: L. JAMIESON, 34, Dorcas Avenue, Pendower, Newcastle-upon-Tyne